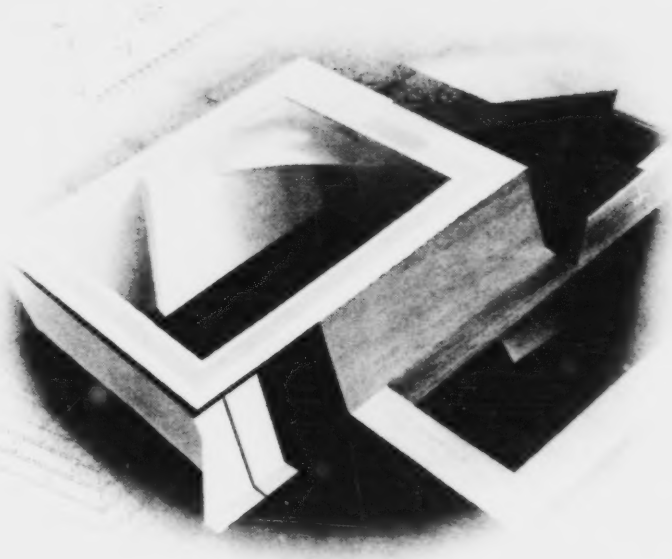
FLASHINGS

BEST PRACTICE GUIDE
BUILDING TECHNOLOGY



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PREFACE

This document provides designers, builders, building owners and building managers with a general understanding of the principles and best practices in the design and construction of flashings.

Studies of roofing failures and cladding problems have shown that a high percentage of these problems are the result of inadequate design and construction of flashings.

Details illustrated in this document represent commonly used flashing construction. These details are intended to illustrate the flashings component only. Other building components are shown in the detail only to complete the illustration; information about them may be incomplete. Other Best Practice Guides deal with full details for different wall systems.

The information in this document is based on building codes, the *Canadian Roofing Contractor's Association Manual*, publications of the National Research Council and Canada Mortgage and Housing Corporation, and the authors' direct experience. A draft of this document was widely circulated, and, wherever possible and appropriate, the authors incorporated the suggestions of the reviewers.

CAUTION

Before the details in this document are incorporated into buildings, they must be reviewed by professionals experienced in this field. This document is only a guide to current best practice in the design and construction of flashings. It cannot replace professional advice.

CHAPTER 1

BASICS OF FLASHINGS

DEFINITION

Flashings are an important line of defence in a building's moisture protection assemblies. Flashings are components of the exterior envelope used to intercept and direct the flow of water to designed drainage paths. They prevent water from penetrating the building. Flashings are also used to direct water away from building elements susceptible to deterioration–by staining, erosion, frost damage and corrosion–when exposed to excessive wetting.

CONTROL OF THE FORCES DIRECTING WATER FLOW

When designing or constructing flashings, the forces that drive the flow of water need to be considered, since water can move upward and sideways as well as downward.

GRAVITY

Water flows downward, from the pull of gravity. Detailing must consider the following:

- Surfaces should slope in the desired direction of flow (minimum 10° slope).
- A build-up of water on the flashing surface should be anticipated, particularly if there is a risk of heavy flow or if normal drainage paths are blocked by ice or other obstructions. Directions of flow might then differ from that expected for the slope.
- Points of discharge should project out beyond materials below the flashing that may deteriorate when in contact with water or ice.
- Terminations on sloped surfaces should be lapped in shingle fashion so that the natural direction of the water is over and onto the next water-shedding surface.

SURFACE TENSION AND CAPILLARY ACTION

Surface tension allows water to flow along the underside of a surface horizontally, and even upward, in narrow spaces such as crevices. In confined spaces, spacing horizontal surfaces more than 9 mm (0.38 in.) apart will prevent the adherence of water to the two surfaces, thus allowing the water to drain away. A "drip" edge is placed at points of discharge to break that surface tension and allow water to drop by gravity.

Water can be drawn into small-diameter (less than 5 mm [0.20 in.]) openings by capillary action, or "wicking," in porous materials such as concrete and brick. The flashing joints should inhibit this action. Design of joints and upturns needs to take this characteristic into consideration.

KINETIC ENERGY

Rain is often directed at flashings with a high velocity and significant horizontal motion. On the upper locations of buildings, the wind actually carries rain drops upward. The momentum of wind forces can be strong enough to carry the rain drops through even small unsealed joints or openings.

DIFFERENTIAL PRESSURES AND AIR CURRENTS

Differential pressures and air flow often occur in ways that drive water through unsealed or poorly sealed joints. Air pressure can drive water through even small holes and gaps. To prevent this, care must be taken when incorporating a flashing into the building air barrier. Alternatively, the joint may be sealed. Flashings at the top of buildings, such as at parapets, are subject to uplift. They should be anchored to the wall securely, and sealed to prevent water ingress. Other systems, such as pressure equalized rainscreens, act as another line of defense in a building's moisture protection. More information on this subject can be found in other Best Practice Guides.

FLASHING PERFORMANCE REQUIREMENTS

In selecting materials to be used as flashing, the following performance requirements should be considered:

WATER BARRIER

The flashing assembly including materials and joints must shed water without allowing leakage.

The ability of the flashing to seal and be detailed to avoid leakage is fundamental. Creating an effective and durable joint seal is often difficult. It is good practice to provide a secondary, continuous flexible membrane flashing under jointed materials, such as brick, stone or sheet metal.

MOVEMENT CAPABILITY

The flashing must be able to accommodate differential thermal and structural movements. It must either be made of a flexible material or have joints designed to accommodate movement. Movements to be considered include: thermal expansion and contraction of all building components, including the flashing itself; normal deflections under service loads; shrinkage and creep of concrete and wood; and expansion of brick after construction.

TERMINATIONS

Terminations should be able to be formed into sharp breaks and to be sufficiently rigid at points of discharge to adequately project water away from materials below.

DURABILITY

The flashing must be tough enough to resist physical damage during construction, as well as during normal wear, which may be related to the environment and building-maintenance activities. Other factors to be considered include deterioration from corrosion, metal incompatibility and galvanic action, deterioration due to exposure to ultraviolet (UV) light, extreme (hot and cold) temperatures, freezing water, and fatigue due to movements.

For more information on durability, the CSA Standard S478, "Durability Guidelines," should be consulted. In general, the service life of flashings must be equal to or more than that of the wall system or roof system at locations where maintenance or replacement of flashings would be uneconomical.

Refer to Table 1.3 (page 1-17X) for flashing materials affected by ultraviolet (UV) radiation. These materials must be protected from sunlight by counter flashings.

COMPATIBILITY

Flashings, and their primers and sealants, must all be chemically compatible with adjacent materials. Avoid contact between dissimilar metals, as this can lead to galvanic corrosion when the metals are moist. The water acts as the electrolyte, and the dissimilar metals act as electrodes.

The galvanic scale classifies metals by how chemically active they are. When two dissimilar metals come in contact under moist conditions, the more active metal corrodes because of the transfer of ions to the more passive metal; the more passive metal remains unharmed. The farther apart the metals are on the list, the faster the ion exchange and the greater the corrosion. If dissimilar metals must be adjacent, separate them with building paper or a bituminous membrane.

Table 1.1: Galvanic Scale

ACTIVE	PASSIVE
Zinc	Copper
Aluminum	
Steel	
Cast Iron	
Lead	
Tin	

Alkaline concrete and mortar aggressively attack materials such as aluminum and copper. Consult the manufacturers of selected materials to determine whether adjacent materials will be compatible.

BUILDABILITY

Creating a flashing detail that is easy to build will greatly increase the likelihood that the flashing will be built to perform acceptably. Considerations include:

- Can the installation of flashings be sequenced so that it is separate from other construction activities, or can it be easily incorporated into other work? For example, coordination may be required between roofing and masonry activities at wall-roof junctions.
- If the installation of the flashings is to be incorporated into other work, do the workers have the required technology and skills?
- Can the flashing accommodate normal stresses?
- Is it possible to mould or modify the material to accommodate unusual conditions, or is it possible to repair damage?

MAINTENANCE

Besides durability, future maintenance of the flashing must be considered. Materials or joint sealants with limited service lives should be avoided if the flashings are not accessible for replacement.

Metal flashings anchored by being built into concrete or masonry cannot be removed to allow for inspection or repair of the materials underneath. This should be considered when selecting materials and details for flashings.

The flashings and sealants should be inspected annually, particularly in areas with the greatest exposure to water and sunlight. The following are signs of deterioration to investigate and rectify:

- corrosion
- missing anchorage
- displacement or damage
- unusual movement
- signs of water leakage
- efflorescence
- deteriorated sealants

FLASHING LOCATIONS

Typical flashing locations include:

- top of exposed walls
- at roof-wall junctions
- around penetrations through roofing
- at valleys in steep roofs
- within walls above doors, windows and other wall penetrations
- at foundation level, to lead water out of the cavity
- at locations where water might enter the building through a juncture between two materials

TYPES OF FLASHINGS

The names used to define flashings give an indication of their function and location. The most common types are described below.

BASE FLASHING

At the intersection of a roof with a wall or another roof penetration, such as a plumbing vent, the roofing system should be turned up to make the junction watertight. The part of the roofing that is turned up is generally known as a "base flashing." It may be made of the same material as the main roofing membrane or of a compatible material (see Figures 1.1 and 1.2).

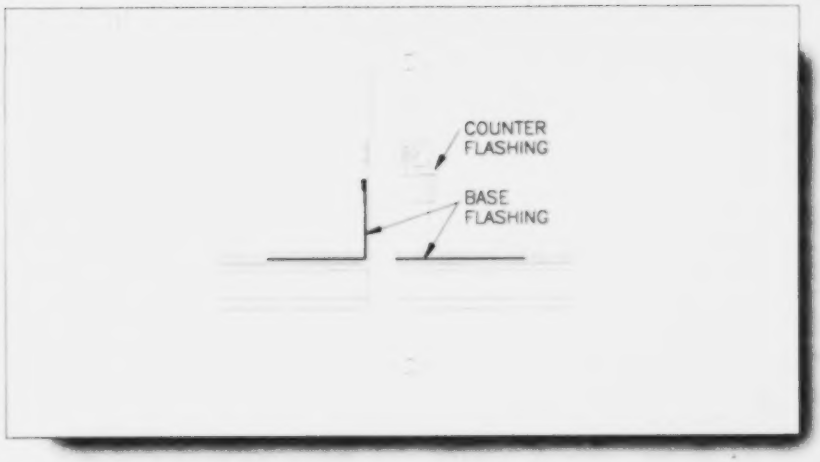


Figure 1.1: Base flashing

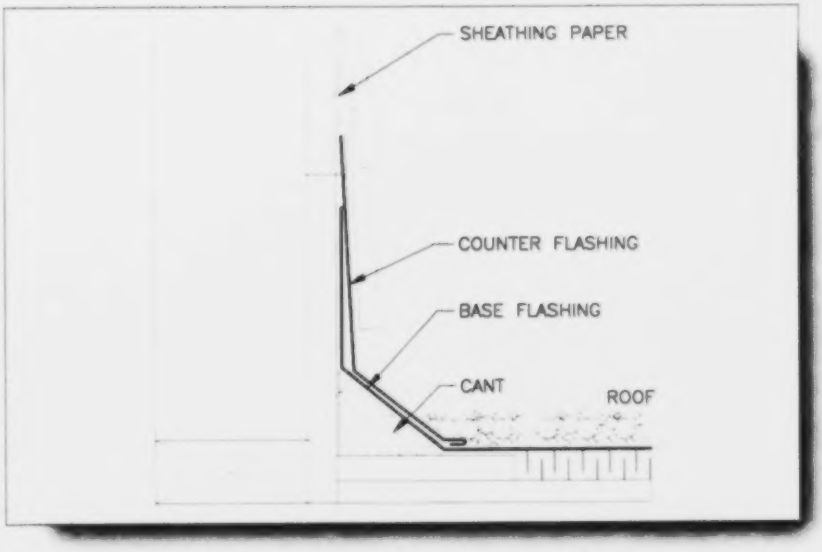


Figure 1.2: Base flashing

COUNTER FLASHING

To prevent water from penetrating behind the top edge of base flashing, a separate piece of flashing should be provided over the top. This flashing is known as a "counter flashing" and is usually made of sheet metal (see Figure 1.3).

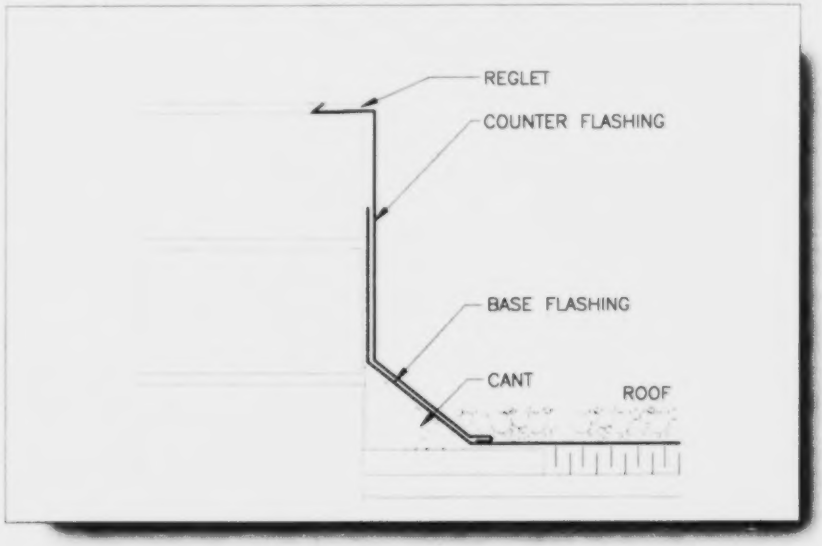


Figure 1.3: Counter flashing

Counter flashing is also required to protect the base flashing from impact damage and damage from UV radiation. This is necessary if the base flashing is a built-up bituminous roofing membrane or made of any material that deteriorates in sunlight.

Where siding is used as cladding material, the base flashing is turned up behind the siding. Counter flashings should be installed so that they are easily removed to allow for inspection of the flexible base flashing below.

VALLEY FLASHING

A "valley flashing" should be installed in the valleys of sloping shingle roofs to give continuity to the roofing system (see Figure 1.4).

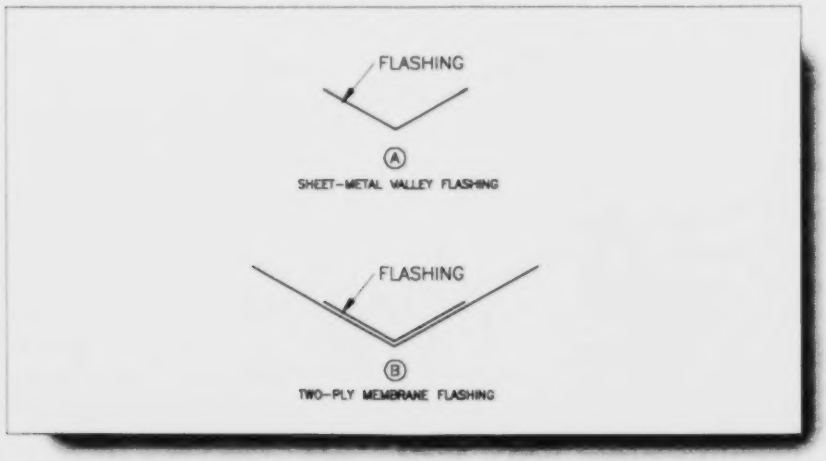


Figure 1.4: Valley flashing

STEPPED FLASHING OR SHINGLED, STEPPED BASE FLASHING FOR SHINGLED ROOFS

At the junction between a roof sloping parallel to a wall, stepped base flashing should be installed in pieces, making it follow the slope. The pieces of flashing are overlapped like the roof shingles. Both base flashing and counter flashing are installed in pieces (see Figure 1.5).

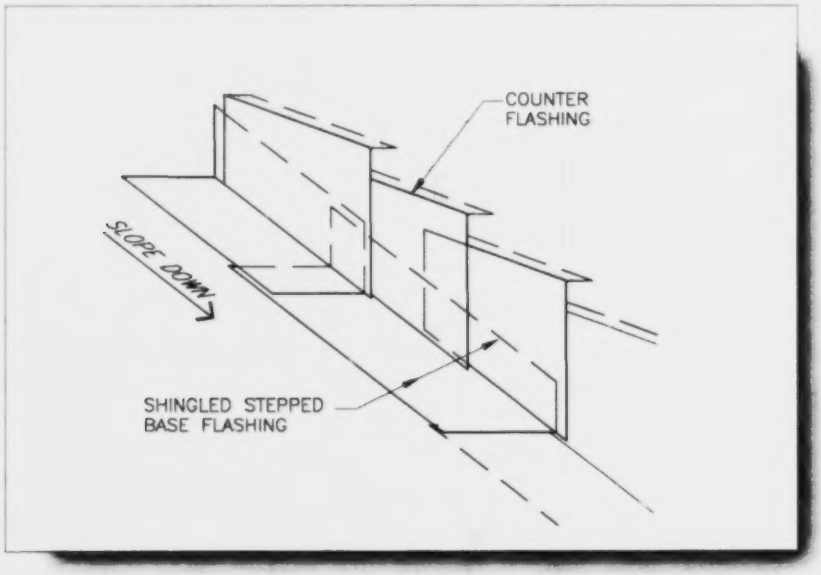


Figure 1.5: Stepped flashing

WALL FLASHING

Wall flashings (see Figures 1.6 and 1.7) prevent water from penetrating the cavity by wind-driven rain, and by air leakage and vapour diffusion from the interior, which result in condensation. A wall flashing intercepts and directs any water flowing down the cavity to the exterior.

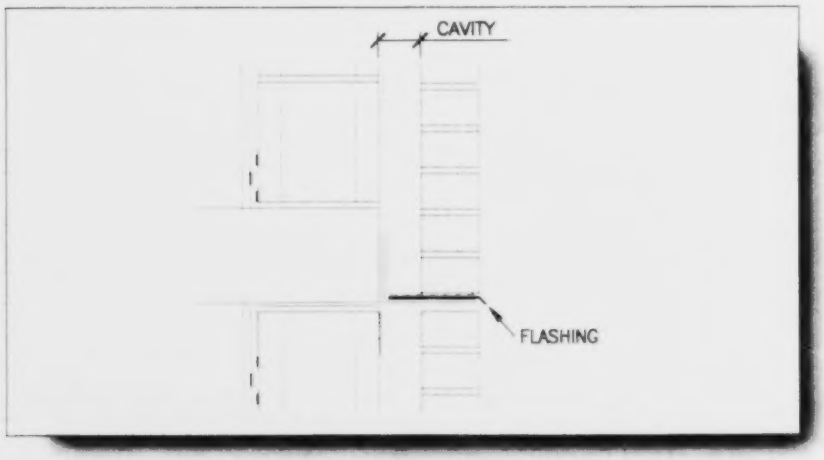


Figure 1.6: Wall flashing

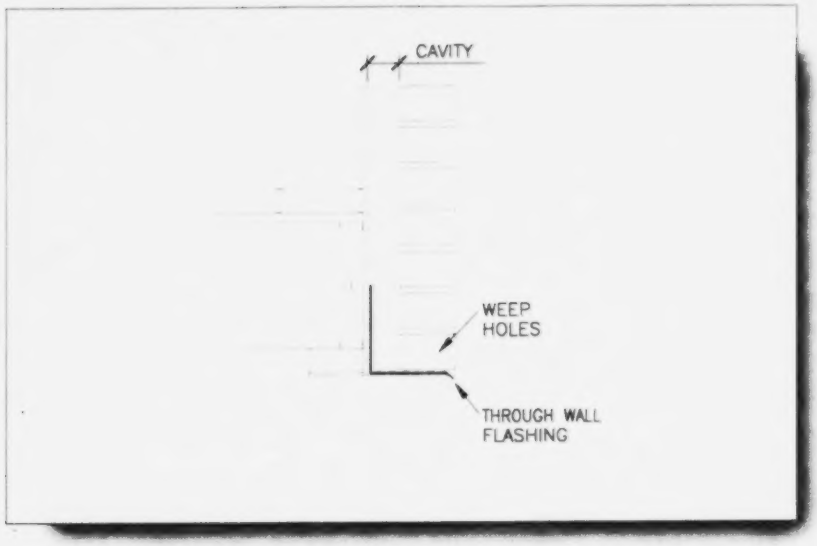


Figure 1.7: Wall flashing

CAP FLASHING

Exterior walls require a "cap" to prevent water from penetrating from the top of the wall. A metal cap flashing does this (see Figure 1.8). The cap flashing sheds water and must be sloped toward the roof to prevent staining of the exterior cladding. It cannot be made waterproof at the joints, and it requires a secondary, continuous and waterproof flashing below it.

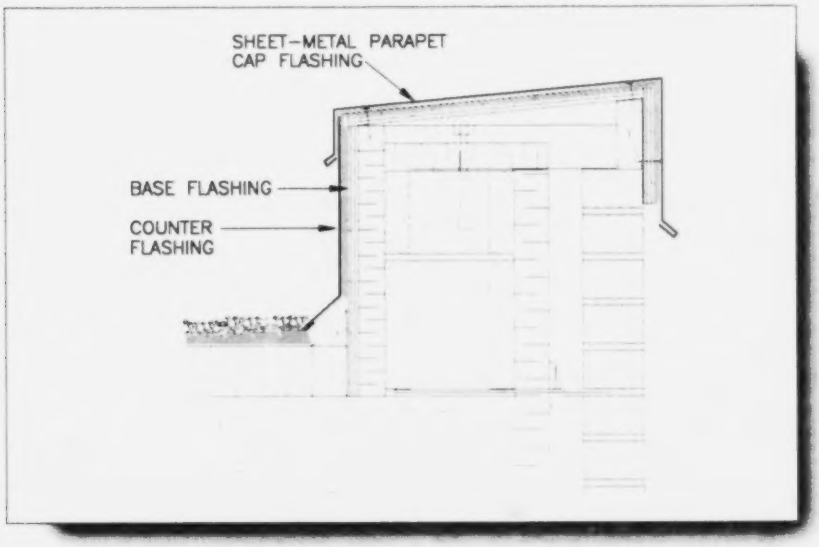


Figure 1.8: Cap flashing

DAMP-PROOF THROUGH-WALL FLASHING

Precast concrete, stone masonry or brick units known as copings close the tops of masonry walls or act as window and door sills. These units also serve to prevent water from entering the top of the wall. If the copings are installed in sections, water may leak through the joints. A damp-proof flashing should be placed between the coping and the top of the masonry wall to prevent water from penetrating into the wall below (see Figure 1.9). Using a damp-proof flashing is also good building practice if copings or sills without joints are used.

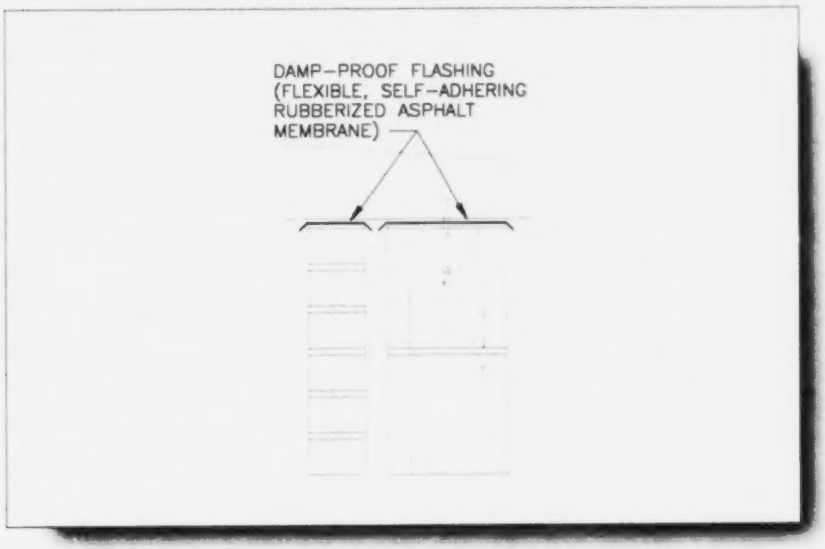


Figure 1.9: Damp-proof flashing

DRIP FLASHING

A drip flashing (see Figure 1.10) should be provided at the base of cladding systems. Drip flashings intercept moisture that has entered behind the cladding and direct it to the outside, as well as redirect water flowing down the face of the wall to prevent it from dripping down on the materials below.

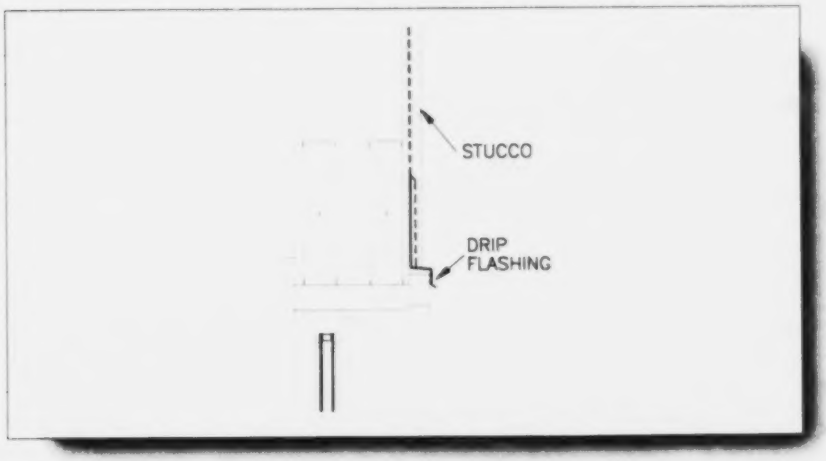


Figure 1.10: Drip flashing

FLASHING MATERIALS AND INSTALLATION

Generally, a variety of factors determines the selection of the flashing material, including function, availability, aesthetics and cost. The cost of the material needs to be carefully weighed against these other factors. One should consider not only the initial material cost but also the performance over the life of the building. Durability and ease of maintenance and repair should also be considered. For example, stainless steel through-wall flashings are commonly used in heritage buildings because these flashings are more durable.

The following sections describe some of the materials available, their limitations and typical installation practices.

BASE FLASHINGS

The following are typical base flashing materials and methods of installation:

General Considerations

- Base flashings used in flat roofs are generally membranes made of the same type of material as, or compatible with, those of the roofing system.
- Base flashings used for shingled roofs are generally metal.
- Metal base flashings are not used with bituminous or elastomeric membranes. Metal flashings are not flexible enough to mould to the supports, and metals have expansion coefficients incompatible with such roofing materials, which makes maintaining the bond between the two materials almost impossible.
- Base flashings must extend up the parapet and over the top (see Figure 1.8, page 1-8).

Built-up Bituminous Roofing

- Base flashings should be made of a built-up bituminous membrane similar to that of the main roofing system and constructed with the same number of plies. Use Type III asphalt for vertical upturns, with paper or organic felts. This type of asphalt is less susceptible to sagging, and the felts hold the asphalt better on a vertical surface than do the fibreglass felts commonly used for a roof.
- Treated wood or fibre cant should be provided to facilitate turning up the roofing felts to the vertical.
- Flashing felts should be lapped at a minimum of 150 mm (6 in.) over the roofing felts, at the cants. Termination of the flashing felts should be staggered on the horizontal surface.
- Membrane flashing is nailed at a minimum of 200 mm (8 in.) above the finished roof membrane. Where necessary, nailing blocks or strips should be provided. Corrosion-resistant fasteners should be used with a maximum spacing of 300 mm (12 in.).
- Metal counter flashing should be provided to protect the base flashing from UV radiation.

Modified Bituminous Roll Roofing

These membrane systems typically consist of two plies: a base sheet and a cap sheet. The application procedures may vary between manufacturers but the procedures described below are fairly typical.

- The roofing membrane and flashings may be different types of modified bituminous roll roofing (MBR) membranes. The membrane may be heat-welded to the vertical support, adhered with an adhesive, or self-adhered.
- MBR flashings are typically lapped over and adhered to the roofing membrane at a minimum of 150 mm (6 in.) along the horizontal surface. They extend up the wall to a minimum of 200 mm (8 in.) above the finished roof surface.
- The top edge of the flashing membrane should be mechanically fastened using a corrosion-resistant bar and fasteners, at a maximum of 300 mm (12 in.).
- Where the cap sheet will be left exposed, it must have embedded mineral granules to protect it from the effects of UV radiation. In this case, there may be no need to have metal counter flashing extending down to protect the membrane.

Elastomeric Roofing Materials

- Elastomeric roofing materials (e.g., PVC, EPDM) should be extended up the wall as base flashings.
- The membrane should be fully adhered to the vertical surface and mechanically fastened at the top edge, as indicated for the MBR membrane. Precautions must be taken to secure the roofing membrane at the perimeter.
- Unless the membrane is resistant to UV radiation, the counter flashing must be extended to protect it. In any case, it is appropriate to extend counter flashing down to provide mechanical protection.

Shingled Roofs

Base flashings for shingled roofs are generally metal. For materials and installation requirements, refer to the sections "Counter Flashings (see page 1-6) and Cap Flashings (see page 1-8)" and "Wall Flashings (see page 1-7)" in this chapter.

VALLEY FLASHINGS

A flashing is provided in the valley of a shingle roof to ensure continuity of the roofing system on the two sides.

In a closed valley, where the flashing is not exposed, one of the following materials must be used:

- sheet metal
- one layer of Type S roll roofing
- one layer of Type M mineral surface roll roofing
- composite membranes, such as rubberized asphalt sheet

In an open valley where the flashing is exposed, either of the following materials must be used:

- sheet metal, in accordance with Table 1.3 (page 1-17)
- one layer of Type S smooth roll roofing or one layer of Type M mineral surface roofing, topped with a second layer of Type M mineral surface roll roofing

COUNTER FLASHINGS AND CAP FLASHINGS

The following are typical materials and methods of installation:

- Counter flashings are made of sheet metal. Types of sheet metal and minimum thicknesses are as shown in Table 1.3 (page 1-17). This table also notes the use and limitations of the different types of materials.
- Contact between dissimilar metals must be avoided.
- Contact between aluminum and masonry must be avoided.
- Counter flashings must be terminated in reglets in masonry walls (see Figure 1.3, page 1-6). The reglets must be sealed with a material resistant to UV radiation. Silicone or a multicomponent polyurethane should be used. Latex, acrylic or mastic sealants are not as durable. Modification in the composition of sealant compounds is not infrequent. Always verify compatibility of UV sensitivity with the product manufacturer.
- Sheet-metal flashings must be fastened to the supporting structure, using corrosion-resistant fasteners compatible with the supporting structure and with the sheet metal.
- Thermal expansion differentials between flashings and wall materials must be taken into account into the design of details. Long runs of flashing must be broken into sections. Lengths should be a maximum of 2400 mm (8 ft.).
- Joints and fastening methods must allow for this differential temperature movement. For example, joints in the flashing must have folded interlock seams. Use cleats or oversized holes to fasten the sheet metal to the support.
- A drip edge must be provided.

WALL FLASHINGS

Materials acceptable for wall flashings are summarized in Table 1.3 (page 1-7). Selection of a particular material depends on the surrounding materials, durability, accessibility for maintenance and replacement, cost, availability, and the designer's preferences. But the following rules must be heeded:

- Avoid contact between dissimilar metals.
- Use corrosion-resistant fasteners.
- Slope flashings to properly drain water off the wall. Install the horizontal portion of any concealed flexible flashings on a continuous solid surface to prevent sags and water accumulation.
- Provide watertight end dams at openings (see Figure 1.11), to prevent water from flowing into the adjacent wall assembly. Extend flashings beyond jamb openings in every case.

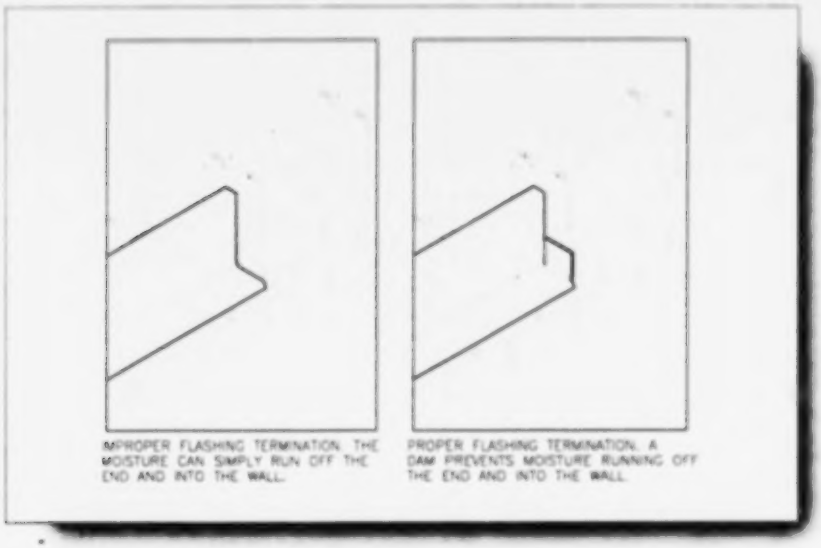

IMPROPER FLASHING TERMINATION. THE MOISTURE CAN SIMPLY RUN OFF THE END AND INTO THE WALL.
PROPER FLASHING TERMINATION. A DAM PREVENTS MOISTURE RUNNING OFF THE END AND INTO THE WALL.

Figure 1.11: Flashings with end dams

- Select material for long-term durability and ease of installation.
- For through-wall flashings below coping stones, stagger joints in flashings with joints in the coping stone. Seal flashing joints and make provision for anchoring the coping stone.
- Extend flashings beyond the supporting wall at a minimum of 10 mm (3/8 in.) to provide a drip edge.

SEALANT JOINTS

Sealants are elastic materials injected in a joint to block the passage of water and/or air while allowing movement between the two sides of the joint. A sealant performs by adhering tightly to the substrate and curing to a rubber-like state. A sealant installed in the joint must be able to expand and contract to accommodate joint movement without cracking (cohesive failure) or breaking away from the substrate (adhesive failure). A sealant requires the maximum extension on a cold day, when the adjoining panels contract to the maximum and at the same time flexible materials have the least capacity to expand (see Figure 1.12).

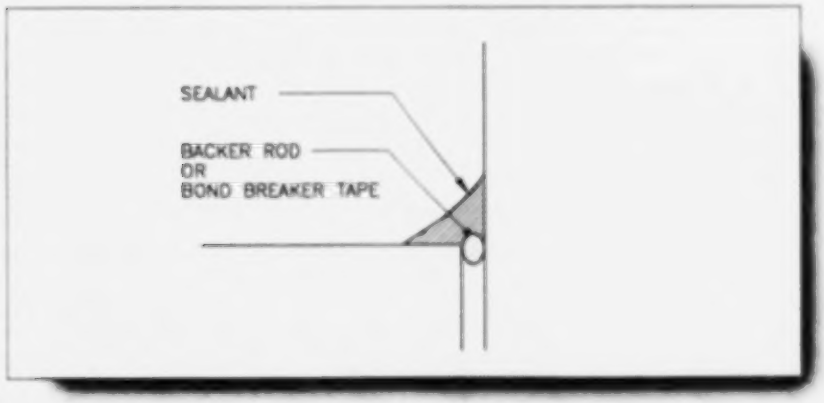


Figure 1.12: Sealant joint

Some flashing materials cannot be folded to form an adequate water barrier and need to be completed by sealants. The following guidelines will ensure a longer life for these sealant joints:

Sealant Selection

Selection of the sealant material should be based on the following criteria:

- water resistance
- UV resistance
- surface adhesion
- movement capability, as tested in accordance with CAN/CGSB-19.0M or ASTM C719
- life expectancy
- exterior surface temperature limits
- cladding material
- surface preparation
- compatibility with adjacent materials
- application temperatures
- curing time

To select the proper sealant, these performance criteria must be compared with the data supplied by the sealant manufacturer.

Proper Joint Design

The width of a sealant joint is based on the expected movement of adjoining cladding panels and the movement capability of the sealant (see Table 1.2, page 1-15). For example, if the movement capability of a sealant is ±25% of the joint width, and the expected movement is 6 mm (¼ in.), the minimum width of this particular sealant joint should be calculated as 6/0.25 = 24 mm (0.9 in.).

EXPECTED MOVEMENT

Minimum joint width = Movement capability of sealant

Generally, sealant joins should not be narrower than 6 mm (¼ in).

A joint narrower than this is difficult to make and has little ability to absorb movement. Joints can be as wide as 50 mm (2 in.), depending on the ability of the sealant not to sag before it has cured.

The depth of sealant in a joint should be equal to half the width of the joint, but not less than 6 mm (¼ in.) or more than 13 mm (½ in.). If the joint is too deep, the sealant may break away from the sides in adhesive failure. If it is not deep enough, the material will tear apart (cohesive failure; see Figure 1.13).

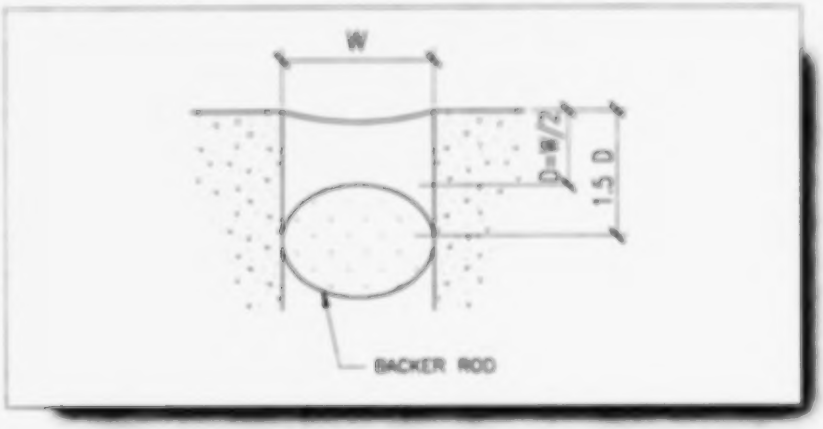


Figure 1.13: Proper joint design

Table 1.2: Joint Width and Depth

WIDTH	DEPTH
6 mm (¼ in.)	6 mm (¼ in.)
20 mm (¾ in.)	10 mm (3/8 in.)
32 mm (1¼ in.)	13 mm maximum (½ in.)

The sealant should be bonded only to the surfaces on two opposite sides, leaving the remaining faces free and able to deform without creating localized stresses. A foam-plastic backer rod or a tape must be used to act as a bond breaker in the middle part of the sealant. A backer rod limits the depth of the sealant to a predetermined dimension, provides a firm surface for tooling the sealant, and gives the sealant bead a narrow waist shape to help minimize stress (see Figure 1.12, page 1-13, and Figure 1.13, page 1-15). Select the backer rod to be 25 to 50% larger than the joint's maximum width.

Proper Material Specification

Sealants are classified according to their elastic properties, in the following categories:

- Low performance (e.g., oil-based and acrylic latex): movement capability 5%; service life, 2–5 years
- Medium performance (e.g., butyl and solvent-release acrylic latex): movement capability 12.5%; service life, 8–10 years
- High performance (e.g., elastomeric sealants: urethanes and silicones): movement capability 25–50%; service life, 10–15 years

For exterior applications involving metal flashings, use high-performance elastomeric sealants composed of urethanes or silicones. Polysulphides have been reported to be affected by exposure to sunlight. The sealant manufacturer should be consulted to determine a sealant's chemical compatibility with adjacent materials.

Proper Application

If possible, seal joints in the spring or fall to avoid large temperature swings during curing. If this is not possible, select days with less variation in day and night temperatures. Large temperature swings during curing (i.e., warm days/cold nights) may cause adhesive failure.

Guidelines for proper installation are:

- Follow manufacturer's instructions related to sealant selection, surface cleaning and priming, applicable temperature, and procedures.
- Clean substrate.
- Install proper-sized backer rod or bond-breaker tape.
- Apply in suitable weather.
- Fill all segments of the joint.
- Perform the joint tooling within the time recommended
- Use tape to mask the adjoining surfaces for proper cleanup.

More information concerning the design of movement joints can be found in Chapter 3 of *Best Practice Guide: Building Envelope Design, Brick Veneer/Concrete Masonry Unit*, published by CMHC.

Table 1.3: Flashing Materials

Material	Application	Minimum thickness of metal	Comments
Aluminum	Wall flashing	0.48 mm (0.019 in.)	Pliable and soft, corrosion-resistant and non-staining. Cannot be soldered. Big's coefficient of expansion (higher than steel).
	Counter/cap flashing	0.48 mm (0.019 in.)	Cannot be used in direct contact with mortar and concrete. Must be coated with bituminous material if it is to be placed adjacent to concrete. Cannot be used in salty and polluted environments.
	Valley flashing	0.48 mm (0.019 in.)	Deteriorates in contact with other metals. Can be used with only aluminum or stainless steel fasteners.
Copper	Wall flashing	0.36 mm (0.014 in.)	Easy to work with, durable and resistant to corrosion although susceptible in salty environments. Easily cold rolled.
	Counter/cap flashing	0.46 mm (0.018 in.)	Cannot be used in direct contact with concrete or mortar. Changes to form a pale green patina colour and may stain adjacent materials. Must not come in contact with dissimilar metals except lead.
	Valley flashing	0.46 mm (0.018 in.)	
Type 304 stainless steel	Wall flashing	0.33 mm (0.013 in.)	Durable, resistant to corrosion and maintenance-free. Not affected by mortar or concrete. Joints must be soldered.
	Counter/cap flashing	0.33 mm (0.013 in.)	
Zinc	Wall flashing	0.46 mm (0.018 in.)	Durable. Not affected by mortar or concrete. Cannot be used in contact with steel unless as a sacrificial anodic coating as in galvanized steel. Corrodes in salty or acidic environments (acid rain).
	Counter/cap flashing	0.46 mm (0.018 in.)	
	Valley flashing	0.46 mm (0.018 in.)	
Galvanized steel	Wall flashing	0.38 mm (0.015 in.)	Least expensive. Easy to work with, economical, durable and stain resistant.
	Counter/cap flashing	0.38 mm (0.015 in.)	Low coefficient of expansion. Not affected by mortar or concrete. Do not use in direct contact with copper or aluminum.
	Valley flashing	0.38 mm (0.015 in.)	Subject to corrosion in acidic or salty air. Thickness of zinc coating must be specified. Refer to specification.

Table 1.3: Flashing Materials (continued)

Material	Application	Minimum thickness of metal	Comments
Lead, lead-coated copper	Wall flashing	1.73 mm (1/16 in.)	Extremely malleable, resistant to atmospheric corrosion, non-staining. Paintable. Very high coefficient of expansion, easily punctured. Cannot be used in contact with uncured mortar or concrete. Should be avoided because of the toxicity of the material.
	Counter/cap flashing	1.73 mm (1/16 in.)	
	Valley flashing	1.73 mm (1/16 in.)	
Reinforced polyethylene	Wall flashing	0.15 mm (0.006 in.)	Should be used only in concealed locations. Not recommended except for flashing at foundation wall.
Copper or aluminum laminated to felt or Kraft paper	Wall flashing	0.15 mm to 0.5 mm (0.006 in. to 0.02 in.)	Should be used only in concealed locations. Durability problems have been reported. Do not use with aluminum or copper laminates in direct contact with mortar or concrete. Do not use in contact with steel.
Type S roll roofing	Wall flashing		Used only in concealed locations, where protected from UV radiation.
Flexible rubberized asphalt or modified bituminous membrane	Wall flashing	1 mm to 4 mm (0.04 in. to 0.16 in.)	Select heat-welded or adhesive type compatible with air barrier. Easy to seal and make watertight. Deteriorates with exposure to sunlight unless protected by mineral granules. Temperature of moisture sensitive installation. Verify with manufacturer for compatibility with sealants, solvents, adhesives, etc.

Notes: This table indicates minimum acceptable thickness of material in normal atmospheric conditions. Thicker material should be used depending on location, type of building and environmental conditions, and durability requirements.

Aluminum and galvanized steel should be prepainted to desired colour.

CHAPTER 2

DETAILS

INTRODUCTION

The CAD details in this chapter are based on the principles of flashing design which are explained in Chapter 1. Each detail is accompanied by an explanation and a new design aid: checklists for the designer and the builder. There may be repetition of written material from one detail to the other. This is intentional. The purpose of this is to make details self-sufficient so that, where possible, the reader will not need to refer to other details.

The details selected are those commonly found in residential construction. These details illustrate some of the best practices in flashing design and construction. Emphasis of the details is only on the flashings. Other components of the building are shown for context and are not completely detailed in many instances.

Where flashing details are illustrated using built-up roofing, they may be adapted for other roofing membranes, using the principles illustrated.

The details are such that a professional designer can modify them to make them conform to the local climate and construction practices; aesthetic, performance and structural criteria; and cost factors. Therefore, CMHC cannot in any way guarantee the performance of the flashings illustrated. The professional designer must assume all liability in the use and modification of these details.

Each building has its own particular difficult joint conditions. Best Practice advice is to pay special attention to drawing these details, as studies have shown that the absence of design details is one of the most common causes of warranty claims. To help the designer, a guide to the use of the CAD CD Rom is included in Chapter 5.

DETAIL 2.1–FOUNDATION WALL/BRICK VENEER INTERSECTION WOOD-FRAME WALL–FLASHING

PURPOSE

To intercept water flowing down the rainscreen wall cavity and direct it to the outside, and to redirect water flowing down the exterior face of the wall to flow away from the foundation wall.

How It Works

- Moisture may enter the cavity as a result of:
  - rain penetration through the veneer
  - water vapour diffusion
  - leakage of moist air from the interior
- Building paper or house wrap acts as a barrier to moisture within the cavity. Moisture will drain to the bottom of the wall where it is intercepted by the flashing and directed to the exterior through the weepholes.
- The flashing is extended beyond the face of the foundation wall and forms a drip edge to break the surface tension, to shed water away from the wall surface below.
- End dams are provided at openings in the wall, such as for doors or windows, at changes in the wall assembly, and at steps in the foundation wall, to prevent water inside the cavity from flowing into other assembly components or into the building interior.
- The drip-edge projection will also give an indication that flashing has been installed. Generally, metal provides a more effective drip edge than flexible membranes. Membrane flashings are also more susceptible to physical damage and deterioration from UV radiation. A compromise may be achieved by using a strip of sheet metal as the drip edge, lapped with a membrane through-wall flashing sealed to the metal.
- Dissimilar metals in contact result in galvanic corrosion. Aluminum corrodes in contact with concrete and mortar.

Designer Checklist

❑ A continuous flashing with a drip-edge projection to shed water away from the foundation wall is specified.

❑ Flexible membrane flashings are shown to be secured to the sheathing by corrosion-resistant mechanical fasteners.

❑ Avoid placing aluminum in contact with concrete and mortar. Avoid placing dissimilar metals in contact with each other.

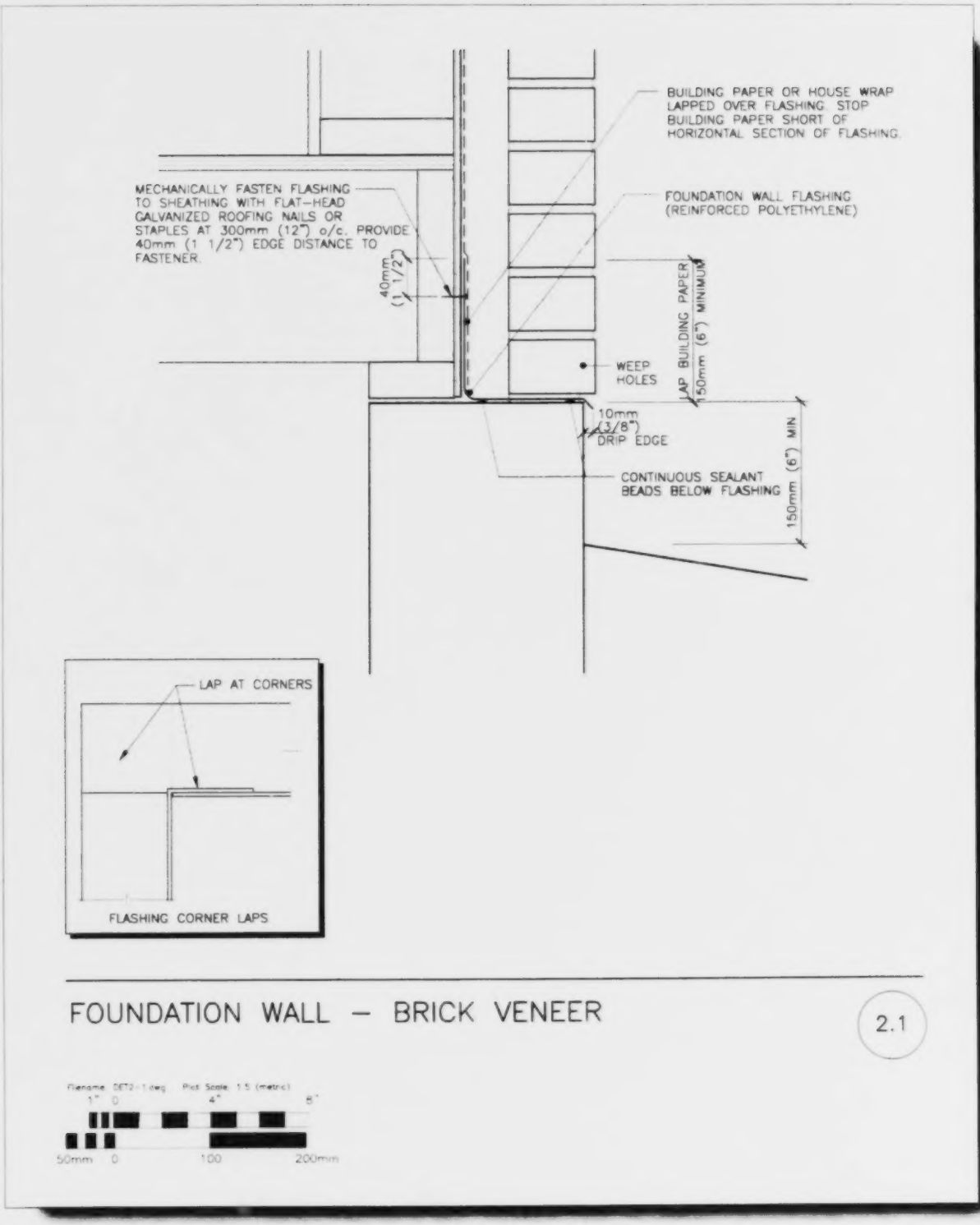
❑ Mechanical fasteners are specified at regular intervals, maximum 300 mm (12 in.) on centre, to ensure tight contact between the flashing and the sheathing.

Builder Checklist

❑ Flashing is installed before the building paper or house wrap is installed.

❑ Building paper or house wrap is stopped short of the horizontal leg of the flashing to avoid wicking up water.

❑ The flashing is fastened to the wall sheathing at the specified intervals to get a tight fit.


BUILDING PAPER OR HOUSE WRAP LAPPED OVER FLASHING. STOP BUILDING PAPER SHORT OF HORIZONTAL SECTION OF FLASHING.
MECHANICALLY FASTEN FLASHING TO SHEATHING WITH FLAT–HEAD GALVANIZED ROOFING NAILS OR STAPLES AT 300mm (12") o/c. PROVIDE 40mm (1 1/2") EDGE DISTANCE TO FASTENER.
FOUNDATION WALL FLASHING (REINFORCED POLYETHYLENE)
40mm (1 1/2")
LAP BUILDING PAPER 150mm (6") MINIMUM
WEEP HOLES
10mm (3/8") DRIP EDGE
CONTINUOUS SEALANT BEADS BELOW FLASHING
150mm (6") MIN
LAP AT CORNERS
FLASHING CORNER LAPS
FOUNDATION WALL – BRICK VENEER
2.1
Filename: DET2-1.dwg Plot Scale: 1.5 (metric)
1" 0 4" 8"
50mm 0 100 200mm

***Detail 2.1:** Foundation Wall/Brick Veneer Intersection Wood-Frame Wall–Flashing*

- ❑ Joints in the flashing are properly lapped (minimum 100 mm [4 in.]) and sealed.
- ❑ The flashing is continuous and lapped at all corners.
- ❑ If flexible membrane flashing is used:
  - Joints are free of fish mouths.
  - The flashing is folded up without cutting.
  - There are no folds where water can collect.
  - The edge protruding from the bottom of the foundation wall is not cut off.
  - A 10 mm (0.38 in.) drip edge is provided.
- ❑ End dams are provided and the end of the flashing is turned up and made watertight. Fold up the flashing if it is a membrane, without cutting it.
- ❑ For metal flashings, a break is provided by turning up the end and sealing it to the upturn at the back by soldering; sealing with a sealant; or a strip of membrane adhered on all sides.

DETAIL 2.2–STEPPED FOUNDATION WALL–MASONRY VENEER

Purpose

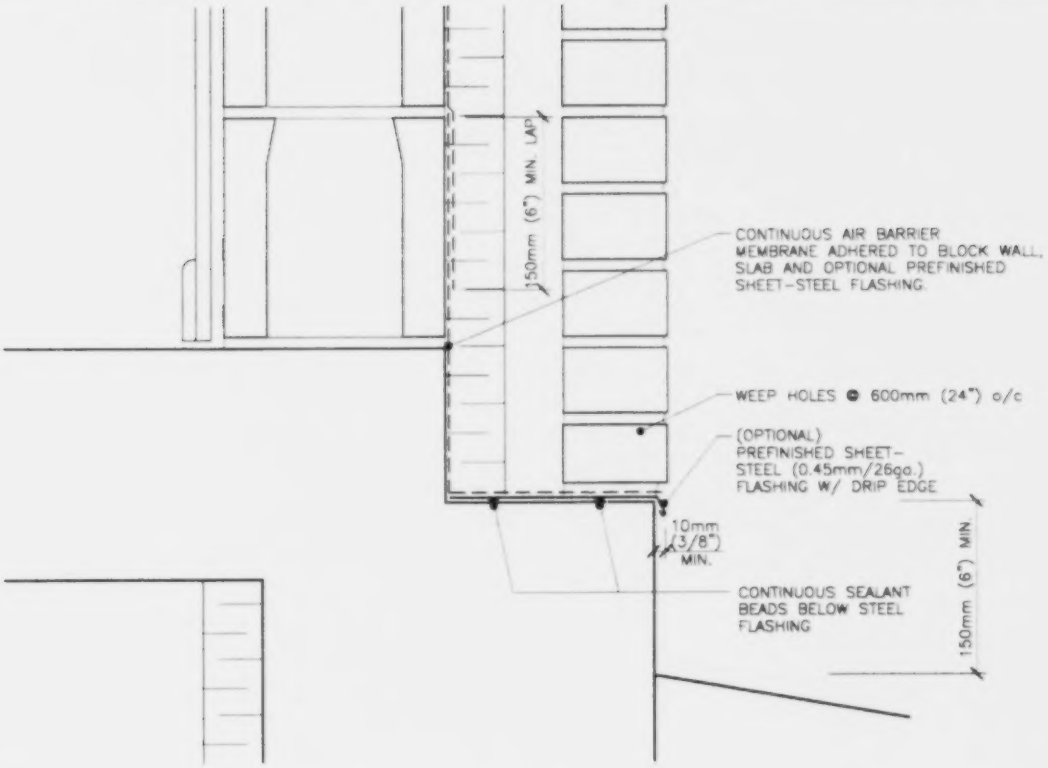
To intercept water within the rainscreen wall and direct it to the outside, and to redirect water, flowing down the exterior face of the wall, away from the foundation wall.

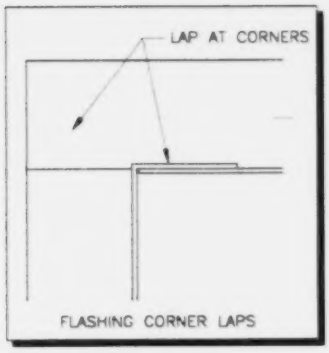
How It Works

- Moisture may enter the cavity as a result of:
  - rain penetration through the veneer
  - water vapour diffusion
  - leakage of moist air from the interior
- Moisture drains to the bottom of the cavity wall where it is intercepted by the flashing and directed to the exterior through the weepholes.
- Dissimilar metals in contact result in galvanic corrosion. Aluminum corrodes in contact with concrete and mortar.
- In the detail shown, the air barrier is a membrane type and is located on the exterior face of the back up wall. The flashing and air barrier membrane are installed on the exterior face of the sheathing, with the air barrier lapped over the flashing. The membrane flashing is, in turn, lapped over a strip of metal flashing to form a drip.
- The flashing extends beyond the exterior face of the foundation wall. The drip breaks the surface tension, to shed water away from the wall.
- End dams are provided at openings in the wall, such as for doors or windows, at changes in the wall assembly, and at steps in the foundation wall, to prevent water inside the cavity from flowing into other assembly components or into the building interior.

Designer Checklist

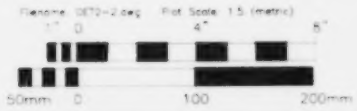
- ❑ Avoid placing aluminum in contact with concrete and mortar. Avoid placing dissimilar metals in contact with each other.


150mm (6") MIN. LAP
CONTINUOUS AIR BARRIER MEMBRANE ADHERED TO BLOCK WALL, SLAB AND OPTIONAL PREFINISHED SHEET-STEEL FLASHING
WEEP HOLES @ 600mm (24") o/c
(OPTIONAL) PREFINISHED SHEET-STEEL (0.45mm/26ga.) FLASHING W/ DRIP EDGE
10mm (3/8") MIN.
CONTINUOUS SEALANT BEADS BELOW STEEL FLASHING
150mm (6") MIN



STEPPED FOUNDATION WALL – MASONRY VENEER

2.2



***Detail 2.2**: Stepped Foundation Wall–Masonry Veneer*

- ❑ A continuous flashing with a drip-edge projection to shed water away from the foundation wall is specified. Metal provides a more effective drip edge than flexible membranes. Membrane flashings are also more susceptible to physical damage and deterioration from UV radiation. A compromise is achieved by using a strip of sheet metal as the drip edge, lapped and sealed by the membrane flashing.
- ❑ A separate through-wall flashing is shown, or an air barrier membrane may be used as through-wall flashing.

Builder Checklist

- ❑ If the air barrier is located on the inside face of the wall cavity, it is continuously sealed to the slab edge. Some types of membrane flashing may be used as part of the air barrier system.
- ❑ The main air barrier is lapped over the flashing to ensure continuity.
- ❑ Joints in the flashing are properly lapped (minimum 100 mm [4 in.]) and sealed.
- ❑ If flexible membrane flashing is used:
  - Joints are free of fish mouths.
  - The exposed edges are NOT cut off if no metal drip edge is used.
- ❑ End dams are provided at changes in the wall assembly, and the end of the flashing is turned up and made watertight. Fold up the flashing if it is a membrane, without cutting it.
- ❑ For metal flashings, a break is provided by turning up the end and sealing it to the upturn at the back by soldering; sealing with a sealant; or a strip of membrane adhered on all sides.

DETAIL 2.3a–PRECAST WINDOW SILL – WOOD-FRAME WALL

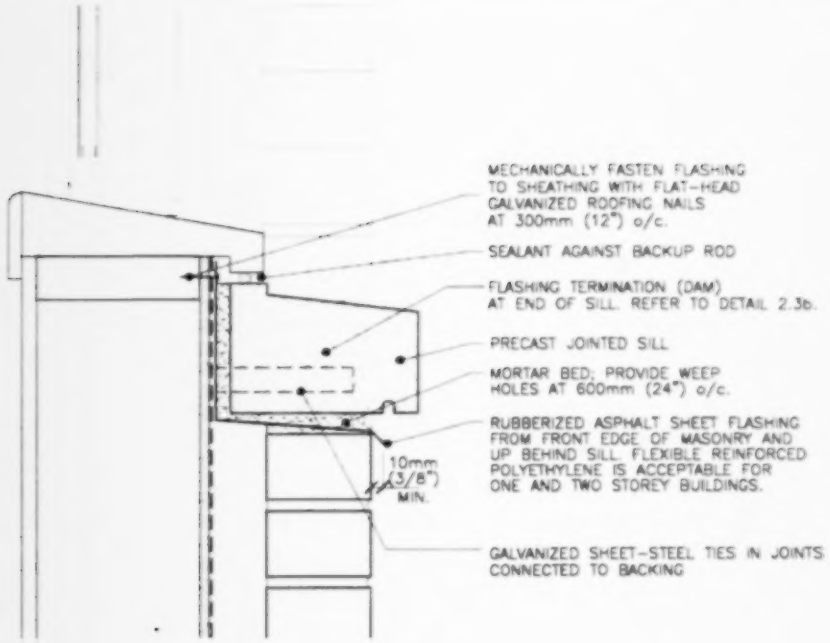
DETAIL 2.3b–FLASHING/SILL TYPES

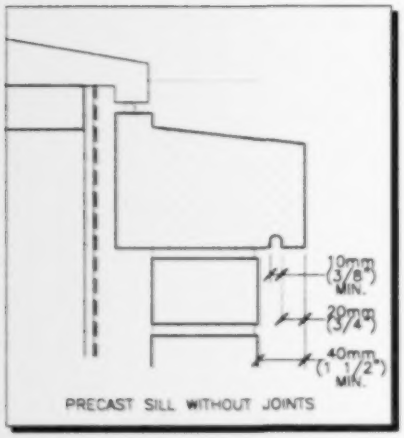
PURPOSE

To intercept water that has penetrated below the sill and redirect it to the outside, away from the wall below. The flashing is not required but is still recommended if the sill consists of a single piece of precast concrete, stone or metal.

How It Works

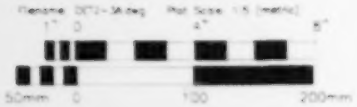
- Window sills are subject to more severe exposure than vertical wall sections because rain, snow and ice accumulate there. Water is absorbed through pores in the sill material units and mortar joints or flows down through cracks.
- A continuous, waterproof flashing is required below jointed sills to prevent saturation of the veneer below, which may result in efflorescence and freeze-thaw damage.
- Dissimilar metals in contact result in galvanic corrosion. Aluminum corrodes in contact with concrete and mortar.
- The flashing is sloped to drain to the exterior face of the wall and extends beyond it to form a drip edge to break the surface tension, to shed water away from the masonry, where it would otherwise result in staining.


MECHANICALLY FASTEN FLASHING TO SHEATHING WITH FLAT-HEAD GALVANIZED ROOFING NAILS AT 300mm (12") o/c.
SEALANT AGAINST BACKUP ROD
FLASHING TERMINATION (DAM) AT END OF SILL. REFER TO DETAIL 2.3b.
PRECAST JOINTED SILL
MORTAR BED; PROVIDE WEEP HOLES AT 600mm (24") o/c.
RUBBERIZED ASPHALT SHEET FLASHING FROM FRONT EDGE OF MASONRY AND UP BEHIND SILL. FLEXIBLE REINFORCED POLYETHYLENE IS ACCEPTABLE FOR ONE AND TWO STOREY BUILDINGS.
10mm (3/8") MIN.
GALVANIZED SHEET-STEEL TIES IN JOINTS CONNECTED TO BACKING



PRECAST WINDOW SILL – WOOD-FRAME WALL

2.3a



***Detail 2.3a**: Precast Window Sill–Wood-Frame Wall*

- End dams are provided at the jambs of the wall opening at the sill to protect adjacent bricks from saturation, and in the flashing below the sill to prevent water flowing into the wall assembly.
- The underside of the sill must be provided with a drip slot which serves as a drip edge, preventing water from flowing back to the face of the wall by breaking the surface tension.

Designer Checklist

❑ Upturns at the end of the sill, steps in lug sills, drip deflectors or a tooled bead of sealant are required to prevent water from running off the sides of the sill and penetrating into the brick. Designers should note that sealants require frequent maintenance and are less durable.

❑ Provide a drip slot on the underside of precast or stone sills.

❑ Avoid placing aluminum in contact with concrete and mortar. Avoid placing dissimilar metals in contact with each other.

❑ Flashing materials are to be continuous across the opening, without joints.

❑ A continuous drip-edge projection is specified to shed water away from the wall below. Metal provides a more effective drip edge than flexible membranes. Membrane flashings are more susceptible to physical damage and deterioration from UV radiation.

❑ Flexible membrane flashings are shown to be secured to the sheathing by methods recommended by manufacturers, such as adhesives or mechanical fasteners.

❑ Corrosion-resistant mechanical fasteners are specified at regular intervals, maximum 300 mm (12 in.) on centre, to ensure tight contact between the flashing and the sheathing.

Builder Checklist

❑ Joints in the flashing are avoided.
- If joints in the flashing cannot be avoided in large openings, they are lapped (a minimum 100 mm [4 in.]) and sealed.

❑ The flashing is sloped to drain outward.

❑ The drip slot is located beyond the exterior face of the veneer.

❑ If end dams are provided at the jambs of the sill using sealant, the sealant beads are extended up 100 mm (4 in.) and tooled to direct water away.

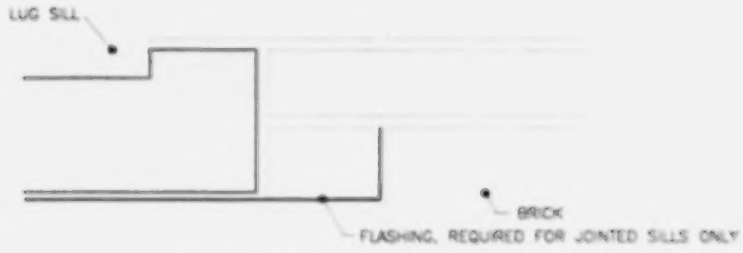
❑ The flashing is extended beyond the face of the wall below to form a drip.

❑ The flashing is extended beyond the jambs of the opening.

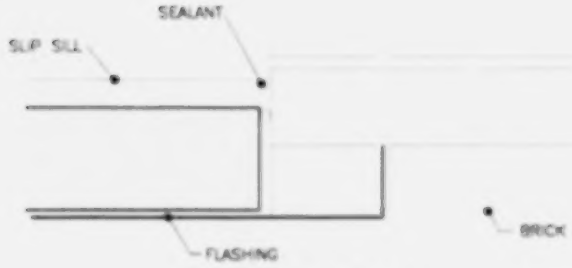
❑ If end dams are required, the end of the flashing is turned up and made watertight.

❑ If membrane flashings are used:
- The exposed drip edges are not cut off.
- The flashing is folded without cutting.
- There are no folds or sags where water can collect.

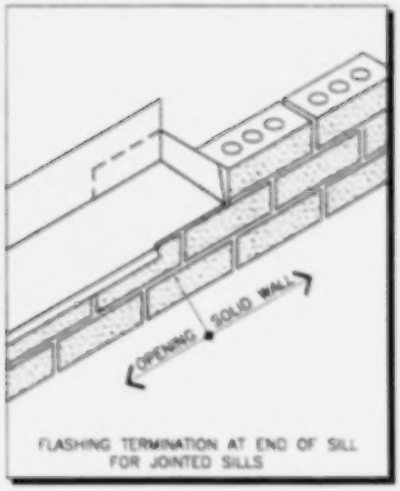
❑ For metal flashings, a break is provided by turning up the end and sealing it to the upturn at the back by soldering; sealing with a sealant; or a strip of membrane adhered on all sides.



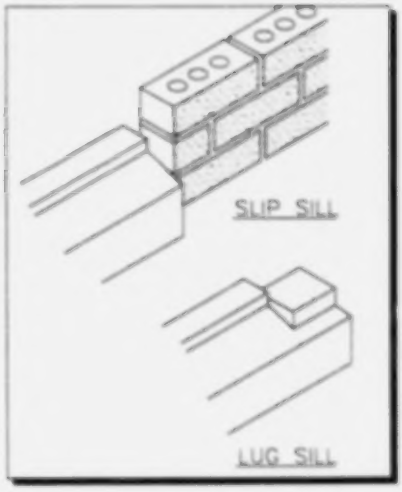
SECTION OF LUG SILL



SECTION AT SLIP SILL



FLASHING TERMINATION AT END OF SILL FOR JOINTED SILLS



FLASHING/SILL TYPES

2.3b

Detail 2.3b: Flashing/Sill Types

DETAIL 2.4–METAL WINDOW SILL/EXTRUDED ALUMINUM SILL WITH RAIN DEFLECTOR

PURPOSE

To intercept water on the horizontal surface and redirect it away from the wall below.

How It Works

- Window sills are subject to more severe exposure than vertical wall sections because rain, snow and ice accumulate there.
- A continuous, extruded metal sill acts as a waterproof barrier. It prevents saturation of the veneer below, which would result in efflorescence and freeze-thaw damage. However, the metal sill ends must be carefully detailed to prevent water penetration into the wall.
- Dissimilar metals in contact result in galvanic corrosion. Aluminum corrodes in contact with concrete and mortar.
- The sill is typically anchored to the underside of the window frame. It is sloped to drain away from the window and extends beyond the exterior face of the wall below to form a drip. The drip-edge projection breaks the surface tension to shed water away from the wall below.

Designer Checklist

❑ Avoid placing aluminum in contact with concrete and mortar. Avoid placing dissimilar metals in contact with each other.

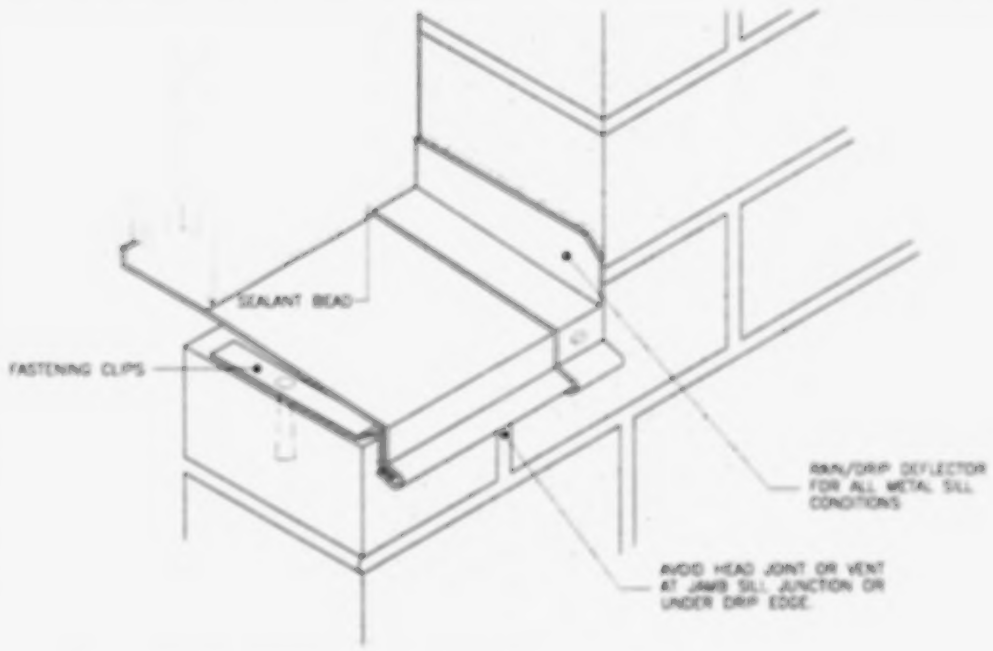
❑ If an aluminum sill is desired to match the window frame, the underside of the sill, in contact with mortar, is coated with a bituminous coating, or an impervious flexible membrane is installed directly underneath the aluminum sill to separate it from the mortar.

❑ Flashing materials are shown to be continuous across the opening, without joints.

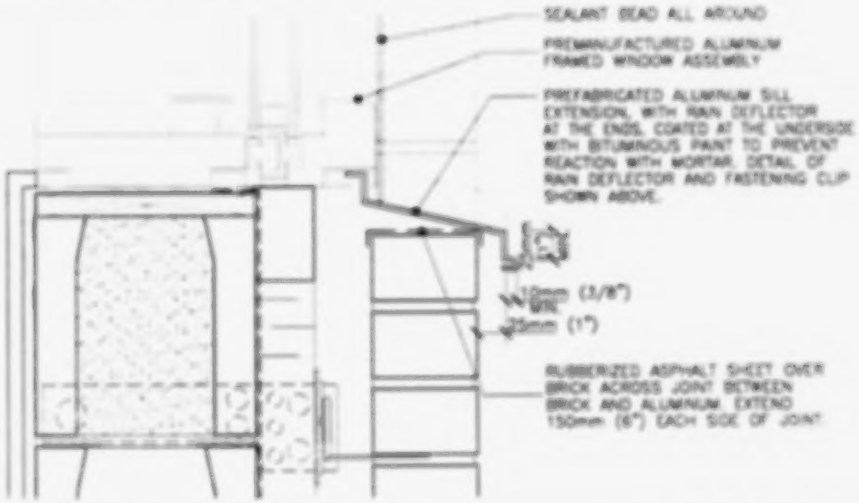
- If joints cannot be avoided, at corners for example, or if the width of the opening is very large, "cap flashings" are specified to be installed over the joint.
- The cap flashings are shown to follow the profile of the sill down to the underside of the drip.
- Cap flashings are shown to be minimum 200 mm (8 in.) wide, centred over the joint, and sealed to the sill on all sides with a continuous bead of sealant.
- If mechanical fasteners are required, they are shown to be installed on one side of the joint to allow movement, due to expansion and contraction of the materials.

❑ Select sealants according to the following:

- What should be the life expectancy of this joint?
- Is the sealant appropriate for the substrate, movement requirements and exposure?
- Have joint dimensions been specified?
- Does the substrate need priming?
- Has a bond breaker or backer rod been specified?


SEALANT BEAD
FASTENING CLIPS
RAIN/DRIP DEFLECTOR FOR ALL METAL SILL CONDITIONS
AVOID HEAD JOINT OR VENT AT JAMB SILL JUNCTION OR UNDER DRIP EDGE.

SILL WITH RAIN DEFLECTOR


SEALANT BEAD ALL AROUND
PREMANUFACTURED ALUMINUM FRAMED WINDOW ASSEMBLY
PREFABRICATED ALUMINUM SILL EXTENSION, WITH RAIN DEFLECTOR AT THE ENDS, COATED AT THE UNDERSIDE WITH BITUMINOUS PAINT TO PREVENT REACTION WITH MORTAR. DETAIL OF RAIN DEFLECTOR AND FASTENING CLIP SHOWN ABOVE.
10mm (3/8") MIN
25mm (1")
RUBBERIZED ASPHALT SHEET OVER BRICK ACROSS JOINT BETWEEN BRICK AND ALUMINUM. EXTEND 150mm (6") EACH SIDE OF JOINT

METAL WINDOW SILL/ EXTRUDED ALUMINUM

2.4

Detail 2.4: Metal Window Sill/Extruded Aluminum Sill with Rain Deflector

Builder Checklist

- ❑ If aluminum sills are used, the aluminum is not in direct contact with mortar.
- ❑ The sill is extended beyond the face of the wall below, to form a drip.
- ❑ The sill is properly sloped away from the window and overhangs the wall by a minimum 25 mm (1 in.).
- ❑ When sealants are required, ensure:
  - The weather and temperature are appropriate for applying the sealant.
  - The surface has been cleaned and primed.
  - The substrate and primer materials are compatible.
  - The sealant joint width and depth are appropriate for the expected movement.
- ❑ The bond breaker or backup rod is of the correct size and properly positioned.
- ❑ The sealant has been tooled to fill the joint, without bubbles or other defects.
- ❑ Joints have been tested to ensure that the sealant will adhere.

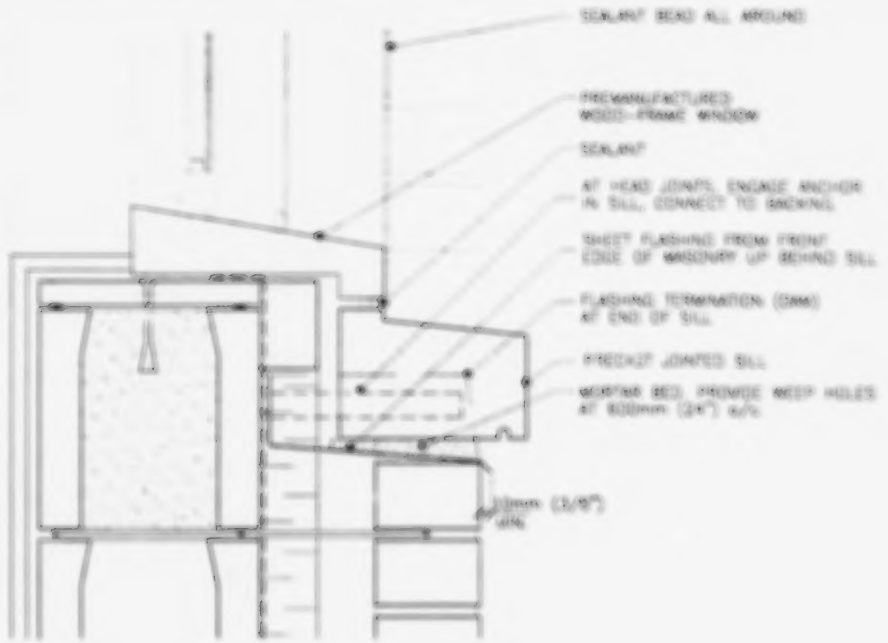
DETAIL 2.5–JOINTED PRECAST WINDOW SILL–BRICK VENEER

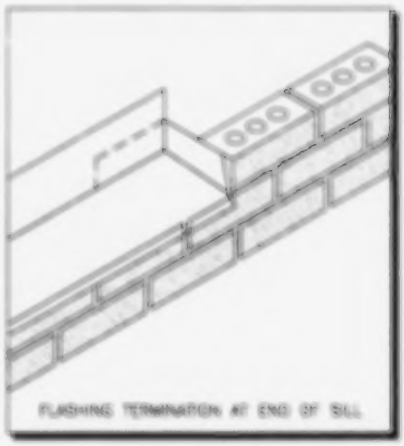
PURPOSE

To intercept water that has penetrated below the precast sill and redirect it to the outside, away from the wall below. The flashing is not required but is still recommended if the sill consists of a single piece of precast concrete, stone or metal.

How It Works

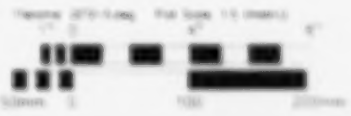
- Window sills are subject to more severe exposure than vertical wall sections because rain, snow and ice accumulate there. Water is absorbed through pores in the sill material units and mortar joints or flows down through cracks.
- Dissimilar metals in contact result in galvanic corrosion. Aluminum corrodes in contact with concrete and mortar.
- A continuous, waterproof flashing is required below jointed sills to prevent saturation of the veneer below, which would result in efflorescence and freeze-thaw damage.
- The sill and flashing are sloped to drain away from the window. The flashing extends beyond the wall to form a drip edge to break the surface tension and to shed water away from the masonry, where it would otherwise result in staining.
- The underside of the sill must be provided with a drip slot to serve the same purpose as the drip edge.
- End dams are provided and the end of the flashing is turned up and made watertight. Fold up the flashing if it is a membrane, without cutting it.
- Membrane flashings are more susceptible to physical damage and deterioration from UV radiation.


SEALANT BEAD ALL AROUND
PREMANUFACTURED WOOD-FRAME WINDOW
SEALANT
AT HEAD JOINTS, ENGAGE ANCHOR IN SILL, CONNECT TO BRICKNOG
SHEET FLASHING FROM FRONT EDGE OF MASONRY UP BEHIND SILL
FLASHING TERMINATION (DAM) AT END OF SILL
PRECAST JOINTED SILL
MORTAR BED, PROVIDE WEEP HOLES AT 600mm (24") c/c
13mm (1/2") GAL



JOINTED PRECAST WINDOW SILL – BRICK VENEER

2.5



Detail 2.5: Jointed Precast Window Sill–Brick Veneer

Designer Checklist

- ❑ Upturns at the end of the sill, steps in lug sills, drip reflectors or a tooled bead of sealant are required to prevent water from running off the sides of the sill and penetrating into the brick. Designers should note that sealants require frequent maintenance and are less durable.
- ❑ Avoid placing aluminum in contact with concrete and mortar. Avoid placing dissimilar metals in contact with each other.
- ❑ Flashing materials are shown to be continuous across the opening, without joints.
- ❑ Select sealants according to the following:
  - What should be the life expectancy of this joint?
  - Is the sealant appropriate for the substrate, movement requirements and exposure?
  - Have joint dimensions been specified?
  - Does the substrate need priming?
  - Has a bond breaker or backer rod been specified?
- ❑ A continuous drip-edge projection is specified to shed water away from the wall below. Metal provides a more effective drip edge than flexible membranes. Membrane flashings are more susceptible to physical damage and deterioration from UV radiation.
- ❑ Flashings are shown to be secured to the back-up structure or window frame with corrosion-resistant fasteners.
- ❑ Corrosion-resistant mechanical fasteners are specified at regular intervals, maximum 300 mm (12 in.) on centre, to ensure tight contact between the flashing and the backing.

Builder Checklist

- ❑ Joints in the flashing are avoided.
  - If joints in the flashing cannot be avoided in large openings, they are lapped (minimum 100 mm [4 in.]) and sealed.
- ❑ The sill and flashing are sloped to drain away from the window and from the jambs of the opening.
- ❑ For membrane flashings, there are no sags or folds where water can accumulate.
- ❑ The flashing is extended beyond the exterior face of the wall below to form a drip.
- ❑ The edges of membrane flashings are not cut off.
- ❑ The flashing is extended beyond the jambs of the opening.
- ❑ For membrane flashings, the flashing is folded without cutting.
- ❑ For metal flashings, a break is provided by turning up the end and sealing it to the upturn at the back by soldering; sealing with a sealant; or a strip of membrane adhered on all sides.
- ❑ The drip slot is located beyond the exterior face of the veneer.
- ❑ If end dams are provided at the jambs of the sill using sealant, the sealant beads are extended up 100 mm (4 in.) and tooled to direct water away.

❑ Sealant joints

- How will this joint work?
- Is the weather and temperature appropriate for applying the sealant application?
- Has the surface been cleaned and primed?
- Are the substrate and primer materials compatible?
- Is the joint width and depth appropriate for the expected movement?
- Is the bond breaker or backer rod of the correct size and properly positioned?
- Has the sealant been tooled to fill the joint without bubbles or other defects?
- Test to ensure that sealant adheres.

DETAIL 2.6–WINDOW/DOOR HEAD–BRICK VENEER

PURPOSE

To intercept water within cavity of the rainscreen wall and direct it to the outside, and to redirect water flowing down the exterior face of the wall to flow away from the wall opening.

How It Works

- Moisture may enter the cavity as a result of:
  - rain penetration through the veneer
  - water vapour diffusion
  - leakage of moist air from the interior
- Moisture drains to the bottom of the cavity wall where it is intercepted by the flashing and directed to the exterior through weepholes.
- In the detail shown, the primary air barrier is a membrane type and is located on the exterior face of the concrete block. The separate through-wall membrane flashing is, in turn, lapped over a strip of metal flashing, forming a drip edge to break the surface tension, to shed water away from the wall opening.
- Dissimilar metals in contact result in galvanic corrosion. Aluminum corrodes in contact with concrete and mortar.
- The flashing extends beyond the exterior face of the wall.
- End dams are typically provided at the ends of the lintel to prevent water from flowing into the adjacent wall assembly.

Designer Checklist

❑ Avoid placing aluminum in contact with concrete and mortar. Avoid placing dissimilar metals in contact with each other.

❑ A continuous flashing with a drip-edge projection is specified to shed water away from the foundation wall. Metal provides a more effective drip edge than flexible membranes. Membrane flashings are also more susceptible to physical damage and deterioration from UV radiation. A compromise is achieved by using a strip of sheet metal as the drip edge, lapped and sealed by the membrane flashing.

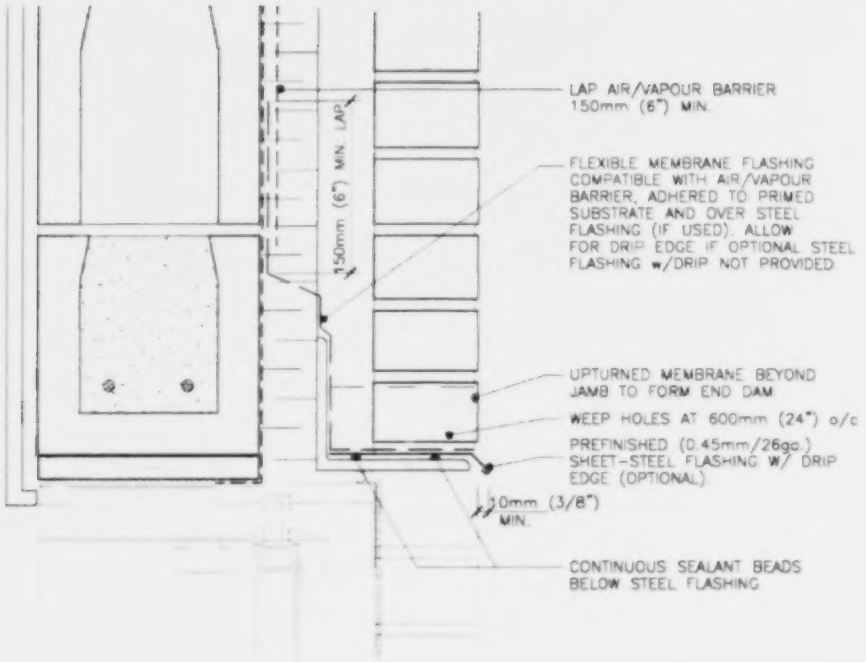
❑ Specify that flashing joints must be lapped and sealed (minimum 100 mm [4 in.]).

Builder Checklist

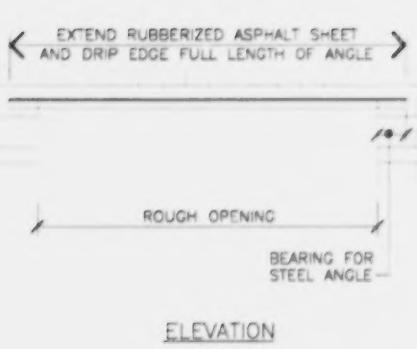
❑ If joints in the flashing cannot be avoided because of the width of opening, seal the joints.

❑ For flexible membrane flashing, ensure:
  - The joints are free of fish mouths.
  - The exposed edges are not cut off.
  - The flashing is folded without cutting.
  - There are no folds where water can collect.

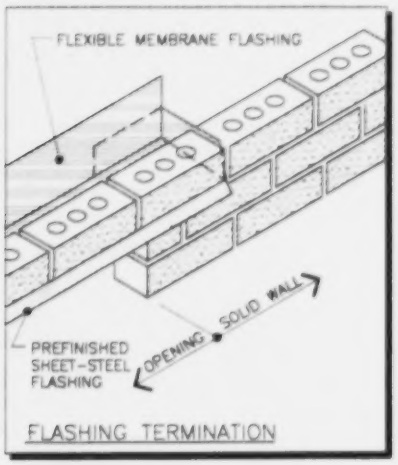
❑ For metal flashing, a break is provided by turning up the end and sealing it to the upturn at the back by soldering; sealing with a sealant; or a strip of membrane adhered on all sides.


LAP AIR/VAPOUR BARRIER
150mm (6") MIN.
150mm (6") MIN. LAP
FLEXIBLE MEMBRANE FLASHING COMPATIBLE WITH AIR/VAPOUR BARRIER, ADHERED TO PRIMED SUBSTRATE AND OVER STEEL FLASHING (IF USED). ALLOW FOR DRIP EDGE IF OPTIONAL STEEL FLASHING w/DRIP NOT PROVIDED
UPTURNED MEMBRANE BEYOND JAMB TO FORM END DAM
WEEP HOLES AT 600mm (24") o/c
PREFINISHED (0.45mm/26ga.) SHEET-STEEL FLASHING W/ DRIP EDGE (OPTIONAL)
10mm (3/8") MIN.
CONTINUOUS SEALANT BEADS BELOW STEEL FLASHING

SECTION



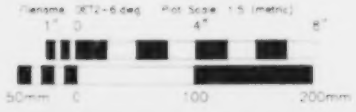
ELEVATION



FLASHING TERMINATION

WINDOW/DOOR HEAD – BRICK VENEER

2.6



Detail 2.6: Window/Door Head–Brick Veneer

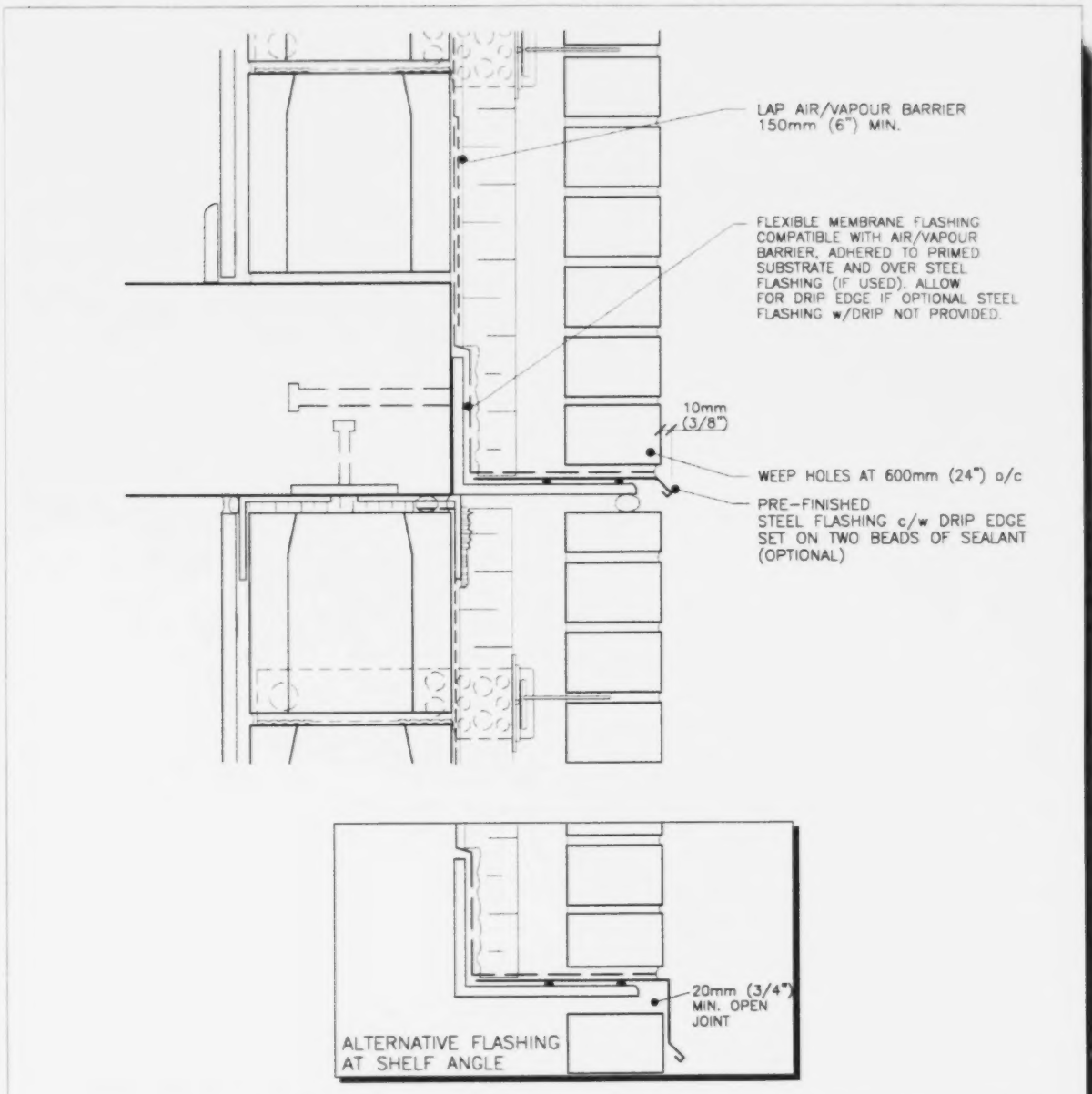
DETAIL 2.7–SHELF ANGLE AT CONCRETE SLAB/BRICK VENEER/CMU

PURPOSE

To intercept water within the cavity of the rainscreen wall and direct it to the outside, and to redirect water flowing down the exterior face of the wall to flow away from the wall surface below.

How It Works

- Moisture may enter the cavity as a result of:
  - rain penetration through the veneer
  - water vapour diffusion
  - leakage of moist air from the interior
- Moisture will drain to the bottom of the cavity wall, where it is intercepted by the flashing and directed to the exterior.
- In the detail shown, the air barrier is a membrane type and is located on the exterior face of the concrete block. It is lapped over a separate membrane through-wall flashing, which is, in turn, lapped over a strip of metal flashing to form a drip.
- Dissimilar metals in contact result in galvanic corrosion. Aluminum corrodes in contact with concrete and mortar.
- Minimum longitudinal laps of 100 mm (4 in.) are recommended.
- A metal drip edge is recommended because a drip formed by extending the membrane past the brick face is not durable, owing to degradation by sunlight (UV radiation).
- The flashing extends beyond the exterior face of the wall below. It forms a drip edge to break the surface tension, to shed water away from the wall.
- End dams are provided at changes in the wall assembly to prevent water flowing into other assembly components or into the building interior.
- This detail also applies to some steel stud construction, in which the air barrier is located inside the wall cavity. The flashing and air barrier membrane are then installed on the exterior face of the sheathing.


LAP AIR/VAPOUR BARRIER
150mm (6") MIN.
FLEXIBLE MEMBRANE FLASHING COMPATIBLE WITH AIR/VAPOUR BARRIER, ADHERED TO PRIMED SUBSTRATE AND OVER STEEL FLASHING (IF USED). ALLOW FOR DRIP EDGE IF OPTIONAL STEEL FLASHING w/DRIP NOT PROVIDED.
10mm (3/8")
WEEP HOLES AT 600mm (24") o/c
PRE-FINISHED STEEL FLASHING c/w DRIP EDGE SET ON TWO BEADS OF SEALANT (OPTIONAL)
20mm (3/4") MIN. OPEN JOINT
ALTERNATIVE FLASHING AT SHELF ANGLE
SHELF ANGLE AT CONCRETE SLAB – BRICK VENEER/CMU
2.7
0
4"
8"
50mm
0
100
200mm

***Detail 2.7:** Shelf Angle at Concrete Slab–Brick Veneer/CMU*

Designer Checklist

- ❑ Avoid placing aluminum in contact with concrete and mortar. Avoid placing dissimilar metals in contact with each other.
- ❑ A continuous flashing with a drip-edge projection is specified to shed water away from the foundation wall. Metal provides a more effective drip edge than flexible membranes. Membrane flashings are also more susceptible to physical damage and deterioration from UV radiation. A compromise is achieved by using a strip of sheet metal as the drip edge, lapped and sealed by the membrane flashing.
- ❑ A separate through-wall flashing is shown. Some air barrier membranes may be used as through-wall flashing.
- ❑ Select sealants according to the following:
  - What should be the life expectancy of this joint?
  - Is the sealant appropriate for the substrate, movement requirements and exposure?
  - Have joint dimensions been specified?
  - Does the substrate need priming?
  - Has a bond breaker or backer rod been specified?

Builder Checklist

- ❑ Joints in the flashing are properly lapped (minimum 100 mm [4 in.]) and sealed.
- ❑ End dams are provided and the end of the flashing is turned up and made watertight. Fold up the flashing if it is a membrane, without cutting it.
- ❑ If the shelf angle is bolted to the concrete slab, the bolts must not puncture the flashing.
- ❑ Sealant joints
  - How will this joint work?
  - Is the weather and temperature appropriate for applying the sealant application?
  - Has the surface been cleaned and primed?
  - Are the substrate and primer materials compatible?
  - Is the joint width and depth appropriate for the expected movement?
  - Is the bond breaker or backer rod of the correct size and properly positioned?
  - Has the sealant been tooled to fill the joint without bubbles or other defects?
  - Test to ensure that sealant adheres.

- ❑ For flexible membrane flashing, ensure:
  - The joints are free of fish mouths.
  - The exposed edges are not cut off.
  - The flashing is folded without cutting.
  - There are no folds or sags where water can collect.
- ❑ For metal flashings, a break is provided by turning up the end and sealing it to the upturn at the back by soldering; sealing with a sealant; or a strip of membrane adhered on all sides.

DETAIL 2.8-WALL PENETRATION-MASONRY VENEER/CMU

PURPOSE

To intercept water from entering the cavity of the rainscreen wall at wall penetrations.

How It Works

- Moisture may enter the cavity as a result of:
  - rain penetration through the veneer
  - water vapour diffusion
  - leakage of moist air from the interior
- Moisture will drain down the cavity, where it is intercepted by the flashing and directed to the exterior through weepholes provided in the exterior face of the louvred vent.
- Dissimilar metals in contact result in galvanic corrosion.
- This detail also applies to steel stud construction, in which the air barrier is located inside the wall cavity. The flashing and the air barrier are then to be installed on the exterior face of the sheathing.

Designer Checklist

❑ Louvred vent and duct must not be of dissimilar metals. Specify corrosion-resistant materials.

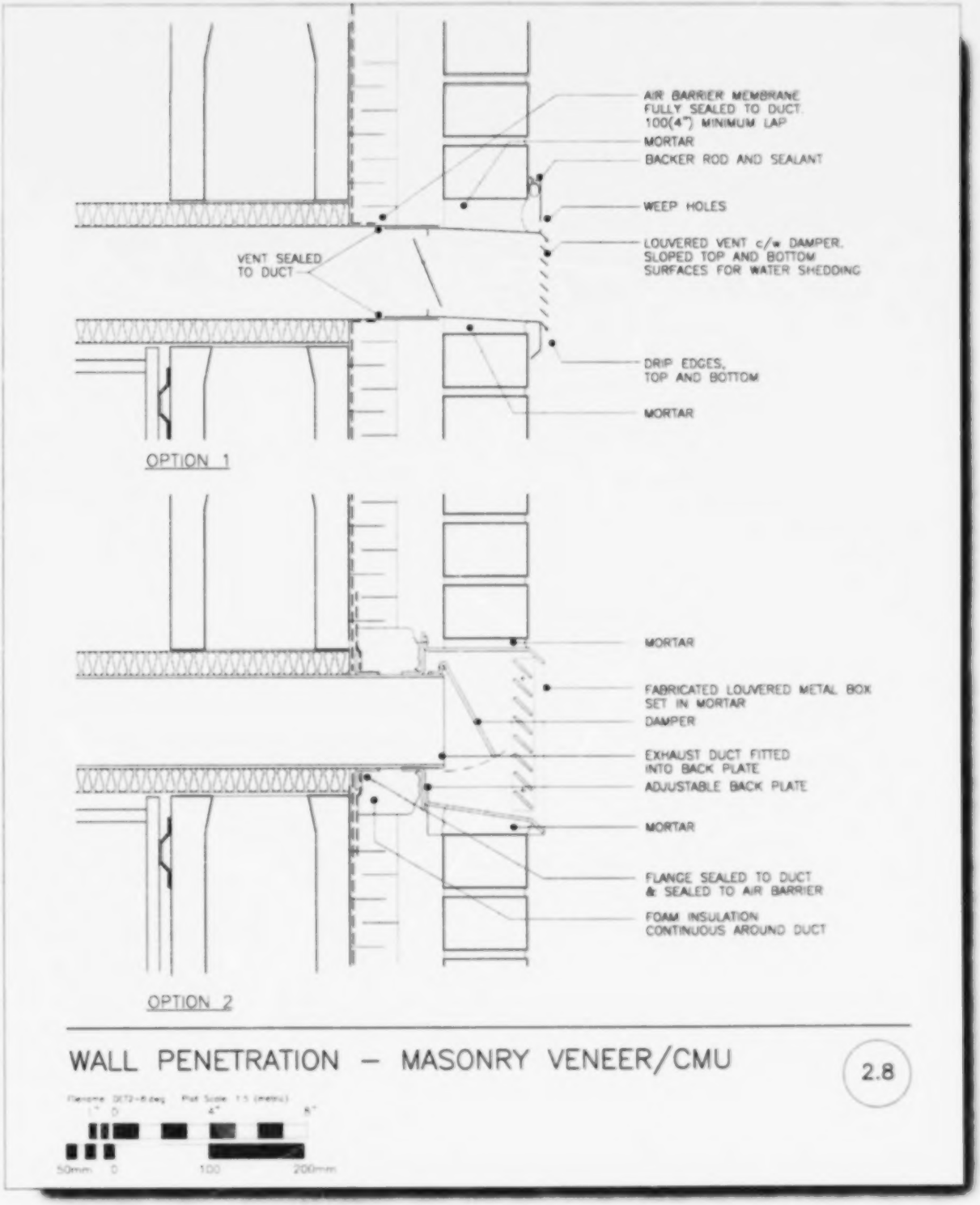
❑ Select sealants according to the following:
  - What should be the life expectancy of this joint?
  - Is the sealant appropriate for the substrate, movement requirements and exposure?
  - Have joint dimensions been specified?
  - Does the substrate need priming?
  - Has a bond breaker or backer rod been specified?

Builder Checklist

❑ The louvred-vent surface is sloped down to drain water out of the cavity.

❑ The air barrier membrane is sealed to all sides of the duct and the vent is sealed to the duct.

❑ Sealant joints
  - How will this joint work?
  - Is the weather and temperature appropriate for applying the sealant application?
  - Has the surface been cleaned and primed?
  - Are the substrate and primer materials compatible?
  - Is the joint width and depth appropriate for the expected movement?
  - Is the bond breaker or backer rod of the correct size and properly positioned?
  - Has the sealant been tooled to fill the joint without bubbles or other defects?
  - Test to ensure that sealant adheres.


AIR BARRIER MEMBRANE FULLY SEALED TO DUCT. 100(4") MINIMUM LAP
MORTAR
BACKER ROD AND SEALANT
WEEP HOLES
LOUVERED VENT c/w DAMPER. SLOPED TOP AND BOTTOM SURFACES FOR WATER SHEDDING
VENT SEALED TO DUCT
DRIP EDGES, TOP AND BOTTOM
MORTAR
OPTION 1
MORTAR
FABRICATED LOUVERED METAL BOX SET IN MORTAR
DAMPER
EXHAUST DUCT FITTED INTO BACK PLATE
ADJUSTABLE BACK PLATE
MORTAR
FLANGE SEALED TO DUCT & SEALED TO AIR BARRIER
FOAM INSULATION CONTINUOUS AROUND DUCT
OPTION 2
WALL PENETRATION – MASONRY VENEER/CMU
2.8
50mm 0 100 200mm

Detail 2.8: Wall Penetration–Masonry Veneer/CMU

DETAIL 2.9–LOW PARAPET–BRICK VENEER

PURPOSE

To prevent water from penetrating the interior of the building, wall cavity and roofing system.

How It Works

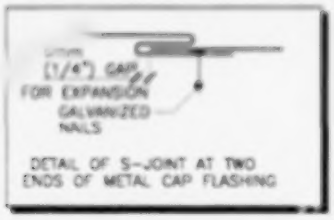
- The roofing membrane is turned up the cant, where it is lapped by a separate membrane called the base flashing, which extends over the parapet to the exterior face of the wall. There it is fastened to the wood blocking, not to the veneer.
- This base flashing constitutes the primary waterproofing along the edge of the roof and the parapet wall. It may be built up of several plies of the same material as that of the roofing membrane, or it may consist of a different but compatible material.
- The flashing must be adequately supported by the wood blocking because the top of the parapet wall can be subject to foot traffic during window washing and other activities requiring staging.
- The cant is used to ease the membrane into the change in direction. It is required for built-up roofing membranes and recommended for some other types of roofing membranes. A cant may not be required for some single-ply membranes. Consult the roofing manufacturer.
- The membrane base flashing is covered by metal counter flashing along the interior perimeter of the roof and by cap flashing over the parapet. These metal flashings protect it from impact damage and UV radiation.
- The cap flashing is sloped toward the roof to prevent water from flowing toward the exterior face of the wall, minimizing the wetting of the veneer below, and protecting pedestrians at ground level.
- The metal cap flashing extends down the exterior face of the wall, at least one brick and mortar joint, and includes a drip-edge projection to direct water draining off the metal out and away from the wall surfaces below.
- A typical S-joint detail for allowing thermal expansion and contraction of the metal cap flashing is shown in the insert. Only one of the metal sections (one side) is fastened to the substrate. The other side is restrained but allowed to move parallel with the wall due to thermal expansion and contraction. They will perform better and have a longer service life than joints relying on sealant.

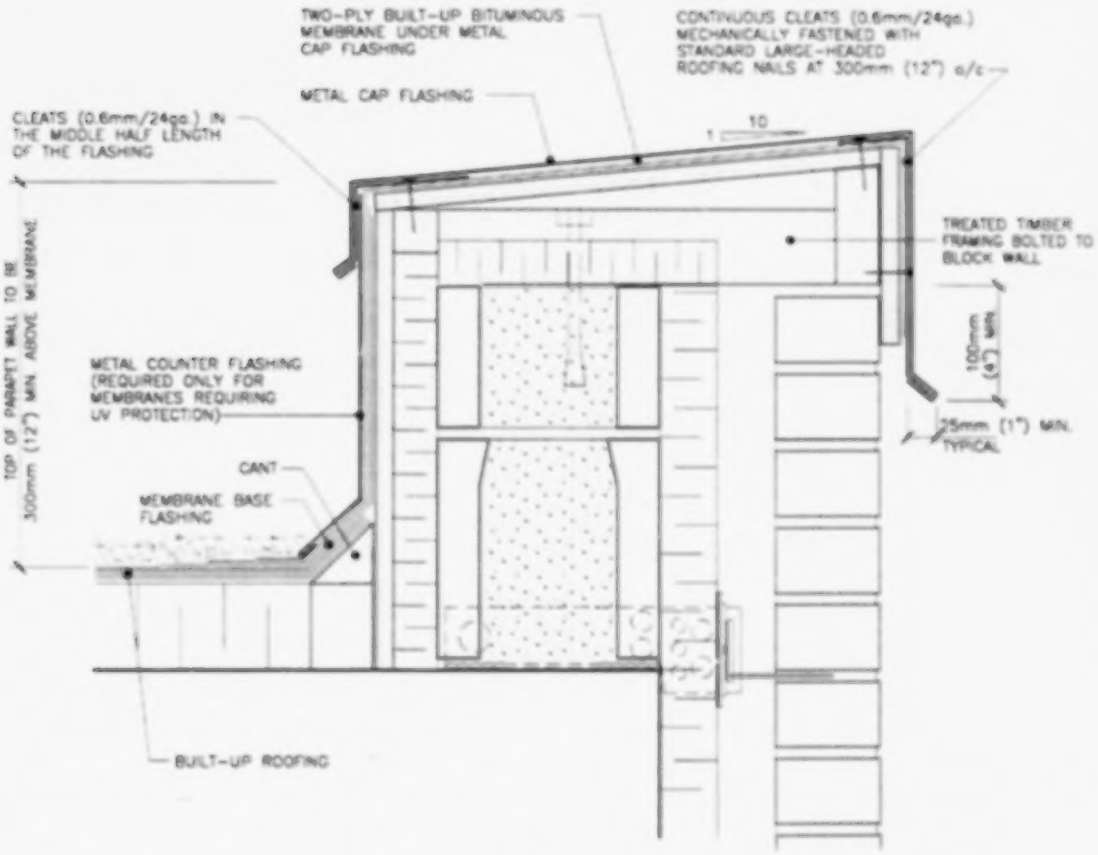
Designer Checklist

- ❑ Cap flashings are jointed to account for thermal movements of the metal.
- ❑ S-joints in the metal flashing are specified, with no exposed fasteners.
- ❑ Provide for differential movement between the metal flashing and the brick veneer.
- ❑ Roof flashings are designed to allow for easy removal during roof replacement.

Builder Checklist

- ❑ Cladding and roofing trades work is coordinated.
- ❑ Flashings are adequately protected from damage during construction.
- ❑ There are no exposed fasteners.



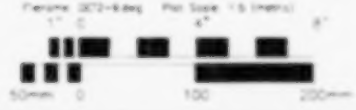

TWO-PLY BUILT-UP BITUMINOUS MEMBRANE UNDER METAL CAP FLASHING
CONTINUOUS CLEATS (0.6mm/24ga.) MECHANICALLY FASTENED WITH STANDARD LARGE-HEADED ROOFING NAILS AT 300mm (12") o/c
METAL CAP FLASHING
CLEATS (0.6mm/24ga.) IN THE MIDDLE HALF LENGTH OF THE FLASHING
TOP OF PARAPET WALL TO BE 300mm (12") MIN ABOVE MEMBRANE
TREATED TIMBER FRAMING BOLTED TO BLOCK WALL
100mm (4") MIN.
25mm (1") MIN. TYPICAL
METAL COUNTER FLASHING (REQUIRED ONLY FOR MEMBRANES REQUIRING UV PROTECTION)
CANT
MEMBRANE BASE FLASHING
BUILT-UP ROOFING

NOTES:

1 ROOFING AND BASE FLASHING – BUILT-UP BITUMINOUS ROOFING
2 METAL CAP FLASHING, COUNTER FLASHING AND CLEATS (0.45mm/26ga): PREFINISHED GALVANIZED SHEET STEEL
3 ON THE INTERIOR OF THE PARAPET, ONLY THE MIDDLE HALF OF THE METAL CAP FLASHING IS SECURED WITH A CLEAT, TO FACILITATE REMOVAL OF THE CAP FLASHING.

LOW PARAPET – BRICK VENEER

2.9



***Detail 2.9:** Low Parapet–Brick Veneer*

DETAIL 2.10-DOOR SILL-BALCONY LOCATION-FLASHING

PURPOSE

To intercept water on the horizontal surface and direct it away from the wall below.

How It Works

- Door sills are subject to rain, snow and ice accumulation, as well as foot traffic. Extruded metal sills are ideally suited to accommodate this.
- Dissimilar metals in contact result in galvanic corrosion. Aluminum corrodes in contact with concrete and mortar.
- A continuous, extruded metal sill acts as a waterproof flashing to intercept rainwater or snow on the horizontal surface and direct it away from the door.
- The door frame is supported on a raised cast-in-place concrete curb to prevent water leakage to the interior of the building.
- An impervious membrane is installed below the door frame from the exterior face of the concrete curb to the inside face of the door frame, where it is turned up. It is also turned up at the jambs of the opening. This membrane acts as a secondary flashing to intercept possible water leakage through the sill of the door frame. If the extruded sill is aluminum, the membrane also prevents contact between the concrete and the aluminum, which will otherwise deteriorate.
- The underside of the sill is typically anchored to the door frame. It is sloped to drain water away from the door and extends beyond the exterior face of the wall below forming a drip. The drip-edge projection breaks the surface tension, to shed water away from the wall below.
- End dams are provided at the jambs of the wall opening to protect the adjacent wall assembly from water damage.
- Air barrier sealant, gasket or adhesive membrane is applied to the frames of all door, window and other penetrations to prevent air leakage through the wall.

Designer Checklist

❑ Avoid placing aluminum in contact with concrete and mortar. Avoid placing dissimilar metals in contact with each other.

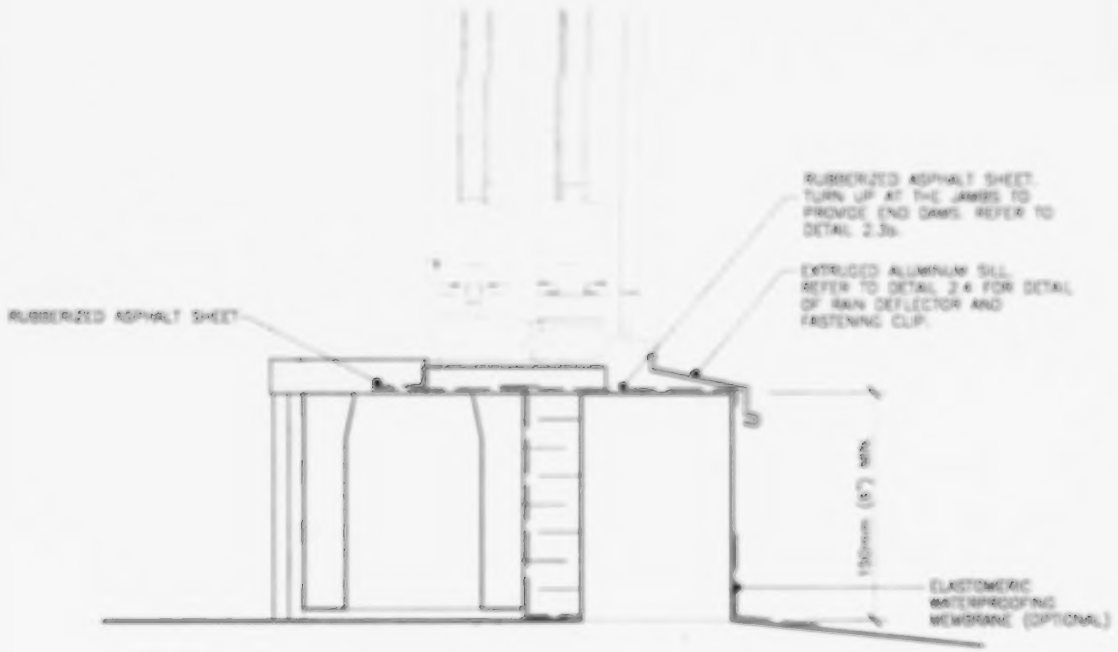
❑ If an aluminum sill is desired to match the door frame, ensure the underside of the sill is not in contact with concrete. The flexible membrane flashing in the detail separates these elements. Alternatively, ensure the underside of the sill is covered with a bituminous coating, but will not serve as a secondary flashing.

❑ Flashing materials are shown to be continuous across the opening, without joints.

❑ Upturns at the end of the sill, steps in lug sills, drip reflectors or a tooled bead of sealant are required to prevent water from running off the sides of the sill and penetrating into the brick. Designers should note that sealants require frequent maintenance and are less durable.

Builder Checklist

❑ If aluminum sills are used, the aluminum is not in direct contact with concrete or mortar.


RUBBERIZED ASPHALT SHEET
RUBBERIZED ASPHALT SHEET. TURN UP AT THE JAMBS TO PROVIDE END DAMS. REFER TO DETAIL 2.3b.
EXTRUDED ALUMINUM SILL. REFER TO DETAIL 2.4 FOR DETAIL OF RAIN DEFLECTOR AND FASTENING CLIP.
150mm (6") MIN.
ELASTOMERIC WATERPROOFING MEMBRANE (OPTIONAL)

DOOR SILL – BALCONY LOCATION – FLASHING

2.10

Detail 2.10: Door Sill–Balcony Location–Flashing

❑ The sill is extended beyond the face of the wall below, to form a drip.

❑ The sill is properly sloped away from the door, and the vertical overlap between the sill and the wall is a minimum 25 mm (1 in.).

DETAIL 2.11–SLOPED ROOF/WALL INTERSECTION–WOOD-FRAME

PURPOSE

To provide a waterproof transition between the shingled roof and the wall, preventing water penetration.

How It Works

- The stepped roof flashing or base flashing at the roof-wall intersection is installed in shingle fashion. It sheds water and stops it from penetrating the wall from the roof.
- A 75 mm (3 in.) height of overlap between consecutive pieces of flashing is recommended to prevent water infiltration.
- Sectional flashing reduces the thermal movement at each lap. Stepped base flashing must be interwoven with shingles.
- The stepped counter flashing is attached only to the wall, and the lower stepped base flashing is attached only to the roof. Differential movements between the roof structure and the wall, therefore, do not affect the flashing performance.
- Wall sheathing paper acts as a moisture barrier within the wall. Lapping the paper over the stepped flashing directs water onto the flashing.
- The stepped counter flashing shown in the detail fulfils the function of both through-wall and counter flashing.
- Stepped counter flashing intercepts water from inside the brick veneer cavity and directs it out onto the shingled roof flashing. If through-wall flashing is omitted and a counter flashing sealed to the veneer face is installed, water inside the wall cavity may result in interior water leakage.
- The back and upper end of each section of stepped counter flashing is turned up to form an end dam to prevent water from flowing into the wall cavity below.
- Weepholes in the brick work allow the water to drain out.

Designer Checklist

❑ The type and thickness of flashing materials and the coordination of flashing installation are specified.

❑ Inspection is specified both at the masonry and roofing stages.

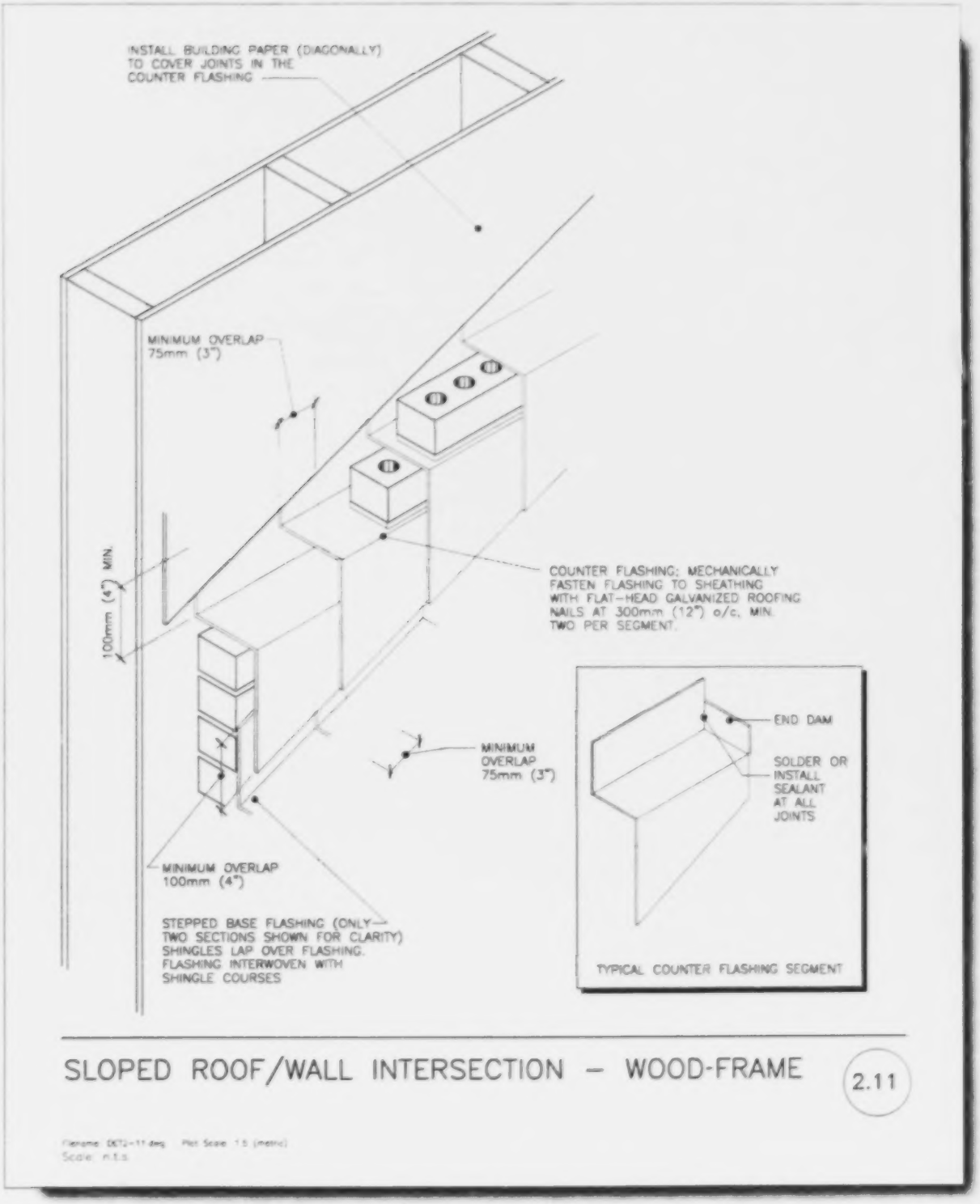
❑ Weepholes in the brick work are specified at 600 mm on centre (24 in.).

❑ Roof flashings are designed to allow easy removal for roof replacement.

Builder Checklist

❑ The wall masonry and roofing work are coordinated so that the flashings can be installed in the correct order and lapped.

- The shingled roof is installed before the masonry above the roof level.
- The base flashing is installed at the same time as the shingles and is interwoven with them.


INSTALL BUILDING PAPER (DIAGONALLY) TO COVER JOINTS IN THE COUNTER FLASHING
MINIMUM OVERLAP 75mm (3")
100mm (4") MIN.
COUNTER FLASHING; MECHANICALLY FASTEN FLASHING TO SHEATHING WITH FLAT-HEAD GALVANIZED ROOFING NAILS AT 300mm (12") o/c. MIN. TWO PER SEGMENT.
MINIMUM OVERLAP 75mm (3")
MINIMUM OVERLAP 100mm (4")
STEPPED BASE FLASHING (ONLY TWO SECTIONS SHOWN FOR CLARITY) SHINGLES LAP OVER FLASHING. FLASHING INTERWOVEN WITH SHINGLE COURSES
END DAM
SOLDER OR INSTALL SEALANT AT ALL JOINTS
TYPICAL COUNTER FLASHING SEGMENT
SLOPED ROOF/WALL INTERSECTION – WOOD-FRAME
2.11

***Detail 2.11:** Sloped Roof/Wall Intersection–Wood-frame*

- The through-wall flashing/counter flashing is installed by the masons after the base flashing.

- Back and upper slopes of stepped wall flashing are turned up into mortar joints to form end dams.
- Wall flashing and base flashing are not fastened together, to allow differential movement.
- End dams are provided by folding up the ends of the flashing.
- For membrane flashing, the flashing is folded without cutting it, but there are no folds where water can collect.
- For metal flashings, a break is provided by turning up the end and sealing it to the upturn at the back by soldering; sealing with a sealant; or a strip of membrane adhered on all sides.

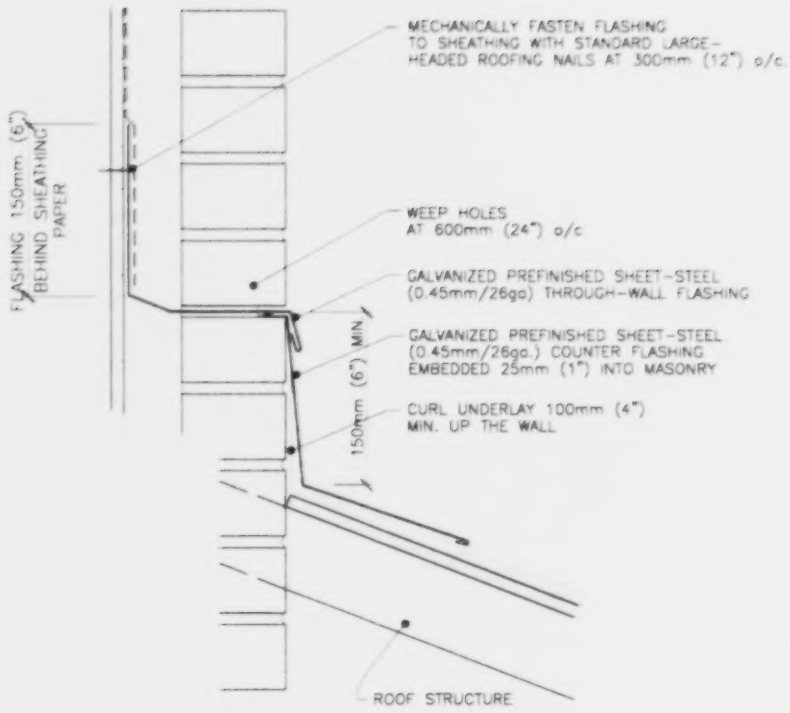
DETAIL 2.12–SLOPED ROOF/WALL INTERSECTION–BRICK VENEER

PURPOSE

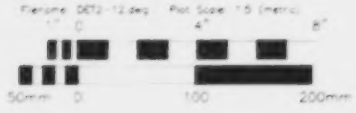
To provide a waterproof transition where the roof is sloping away from the wall, and to intercept water flowing down the wall cavity and direct it to the outside.

How It Works

- The flashing consists of two components: a through-wall flashing and a counter flashing.
- The through-wall flashing intercepts water flowing down the wall cavity and directs it to the outside.
- Moisture may enter the cavity as a result of:
  - rain penetration through the veneer
  - water vapour diffusion from the interior
  - air leakage from the interior
- Dissimilar metals in contact result in galvanic corrosion. Aluminum corrodes in contact with concrete and mortar.
- Sheathing paper (building paper or house wrap) acts as the moisture barrier within the wall. Lap the sheathing paper over the flashing.
- The flashing is extended beyond the face of the wall and forms a drip to shed water away from the wall surface below, as shown. Alternatively, it is lapped over the counter flashing.
- The roof underlay is turned up the vertical wall surface a minimum of 100 mm (4 in.).
- The shingles are continuous up to the intersection with the wall.
- A metal counter flashing is installed to direct water away from the roof-wall intersection. The counter flashing is terminated inside the brick veneer wall, into a reglet left by the mason. It is fastened or wedged in place.
- The reglet should be located a minimum of 150 mm (6 in.) up the wall, directly below, or in the first mortar joint below the through-wall flashing. This is to prevent water penetration through the brick and into the wall cavity below.



SLOPED ROOF/WALL INTERSECTION – BRICK VENEER 2.12



***Detail 2.12:** Sloped Roof/Wall Intersection–Brick Veneer*

Designer Checklist

- ❑ A continuous flashing with a drip-edge projection is specified to shed water away from the foundation wall. Metal provides a more effective drip edge than flexible membranes. Membrane flashings are also more susceptible to physical damage and deterioration from UV radiation. A compromise is achieved by using a strip of sheet metal as the drip edge, lapped and sealed by the membrane flashing.
- ❑ Flexible membrane flashings are shown to be secured to the sheathing with mechanical fasteners, maximum 300 mm (12 in.) on centre, ensuring tight contact between flashing and sheathing. Use compatible adhesives and primers.
- ❑ Avoid placing aluminum in contact with concrete and mortar. Avoid placing dissimilar metals in contact with each other.
- ❑ Metal counter flashings with locked S-joints are specified. They will perform better and have a longer service life than joints relying on sealant.
- ❑ If ice damming or snow accumulation are concerns, specify a self-sealing composite membrane as underlay. An additional base flashing is generally not required because the roof is sloped away from the wall and water is shed naturally.
- ❑ Through-wall flashing is shown to be extended to lap over the counter flashing taking into account the traditional sequencing of masonry and roofing work.
- ❑ Roof flashings are designed to allow easy removal for roof replacement.

Builder Checklist

- ❑ The through-wall flashing is properly fastened to the sheathing to get a tight fit.
- ❑ Through-wall flashings are installed before the moisture barrier is installed.
- ❑ The moisture barrier is lapped over the flashing but stops short of the horizontal leg, to avoid wicking up water.
- ❑ Joints in the through-wall flashing are lapped (minimum 100 mm [4 in.]) and sealed.
- ❑ For flexible membrane flashings:
  - The joints are free of fish mouths.
  - Through-wall flashing is used.
  - The exposed edge is not cut off, unless a metal drip edge is used, as in the detail.

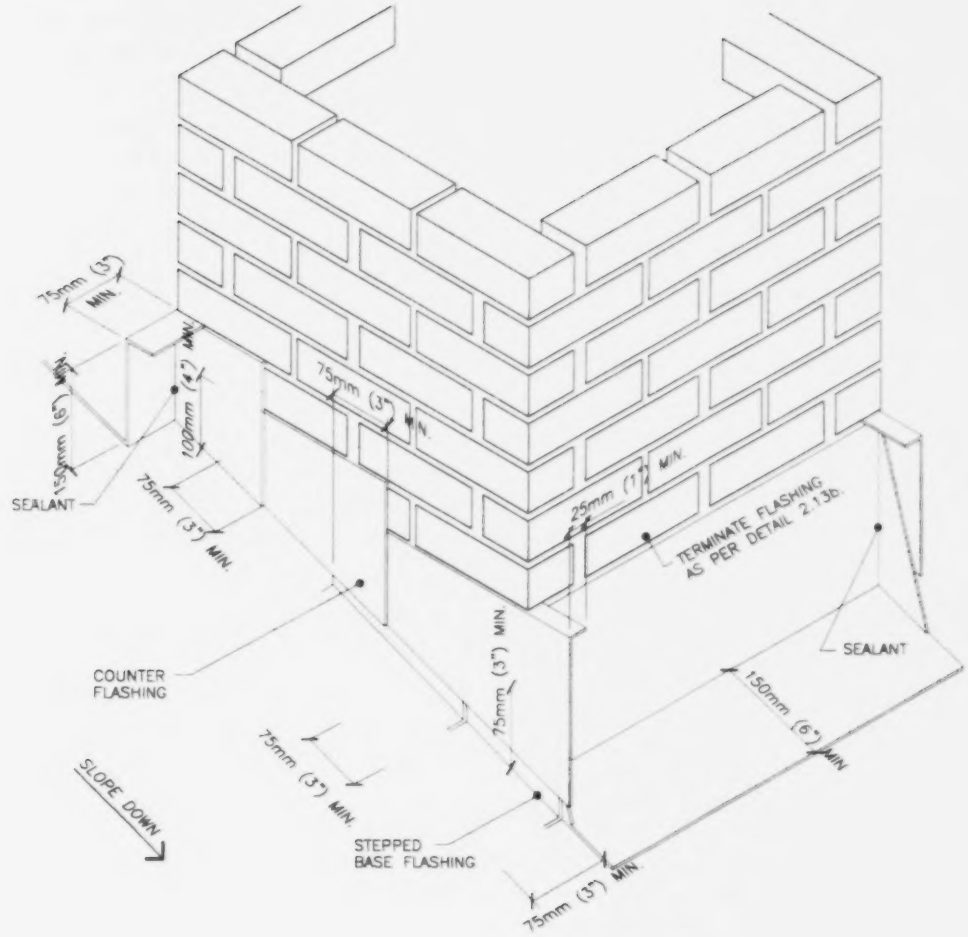
DETAIL 2.13a–ROOF PENETRATIONS–BRICK CHIMNEY

DETAIL 2.13b–ROOF PENETRATIONS–UPPER SIDE OF BRICK CHIMNEY

DETAIL 2.13c–ROOF PENETRATIONS–BRICK CHIMNEY SADDLE

PURPOSE

To prevent water from penetrating at the chimney/roof intersection.



ROOF PENETRATIONS – BRICK CHIMNEY

2.13a

Filename: DET2-13A.dwg Plot Scale: 1:5 (metric)
Scale: n.t.s.

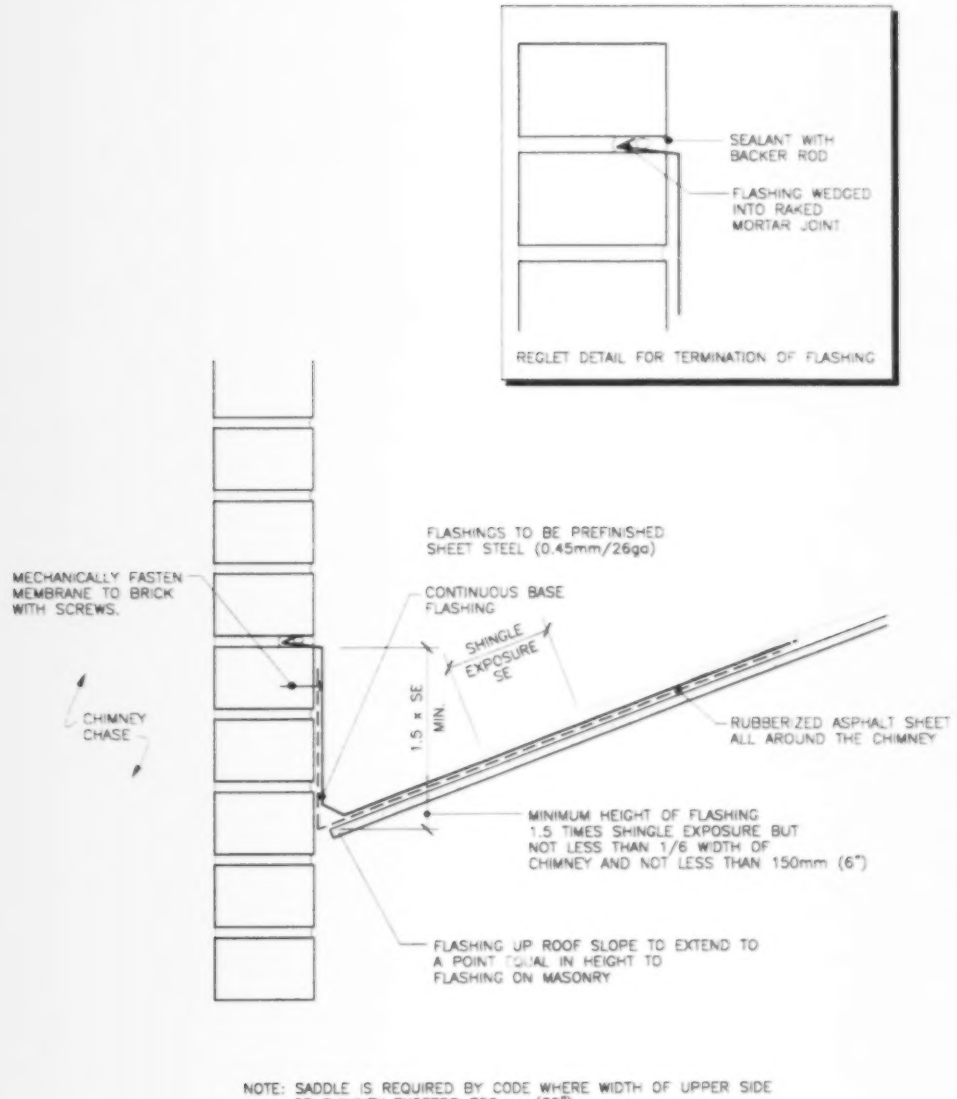
Detail 2.13a: Roof Penetrations–Brick Chimney

How It Works

- The flashing at the low side of the chimney base is lapped over the course of shingles immediately below the chimney, to effectively shed water.
- The shingled stepped base flashing at the side of the chimney is then interwoven with each course of asphalt roof shingles, to provide water shedding. The base flashing must extend up the wall a minimum of 75 mm (3 in.) but is not fastened to it.
- The counter flashing is installed in a reglet in the masonry and fastened or wedged in place. Minimum embedment is 25 mm (1 in.). The joint is sealed with a sealant. Minimum overlap between the base and counter flashing is 75 mm (3 in.).
- Separate shingled base flashing and stepped counter flashing allow differential movement between chimney and roof structures.
- The saddle drawn in Detail 2.13c directs water away from the upper part of the chimney, where it may otherwise accumulate. All joints should be soldered to make the saddle watertight.
- Although the Building Code calls for a saddle only for chimneys wider than 750 mm [30 in.], it is good practice to use saddles for all chimneys and other locations where the roof slopes down into a vertical projection.
- Prefinished sheet-steel flashing can be used. A longer life can be obtained by using stainless steel or copper.
- Although it is commonly done, it is not good practice to only seal the counter flashing to the face of the masonry without turning it into a reglet. This type of joint is very susceptible to water leakage as it is completely exposed and the sealant will require continuous maintenance.
- Annual inspection and regular maintenance of sealants is required to protect against rain penetration.

Designer Checklist

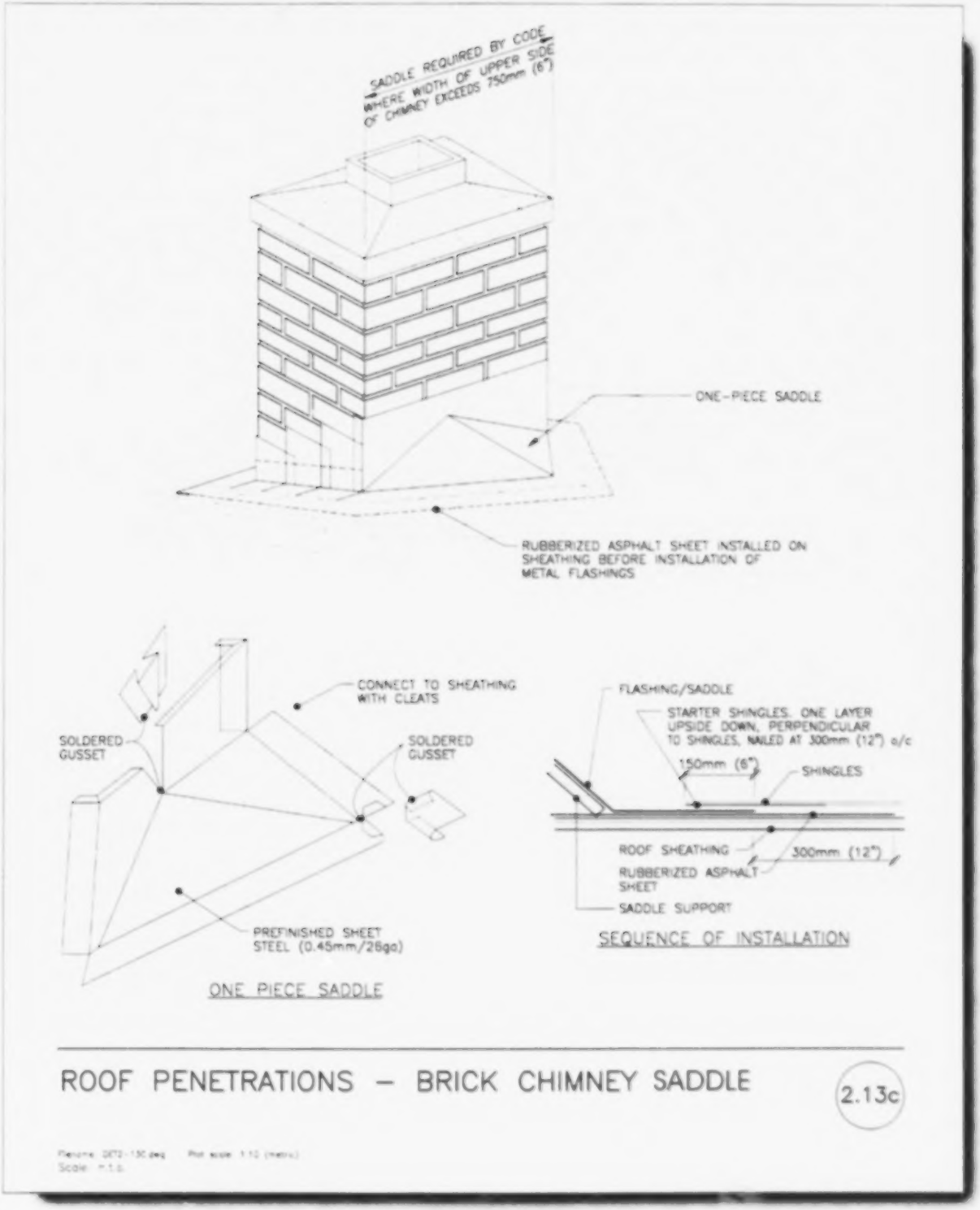
- ❑ Specify no aluminum, which reacts with the alkali in mortar.
- ❑ A saddle is specified for chimneys wider than 750 mm (30 in.).
- ❑ For additional water protection, a self-sealing waterproofing sheet or roll roofing is specified as an underlay around the chimney, under the saddle, and up the slope of the roof.
- ❑ Roof flashings are designed to allow easy removal for roof replacement.
- ❑ Select sealants according to the following:
  - What should be the life expectancy of this joint?
  - Is the sealant appropriate for the substrate, movement requirements and exposure?
  - Have joint dimensions been specified?
  - Does the substrate need priming?
  - Has a bond breaker or backer rod been specified?


SEALANT WITH BACKER ROD
FLASHING WEDGED INTO RAKED MORTAR JOINT
REGLET DETAIL FOR TERMINATION OF FLASHING
FLASHINGS TO BE PREFINISHED SHEET STEEL (0.45mm/26ga)
MECHANICALLY FASTEN MEMBRANE TO BRICK WITH SCREWS.
CONTINUOUS BASE FLASHING
SHINGLE EXPOSURE SE
1.5 x SE MIN
CHIMNEY CHASE
RUBBERIZED ASPHALT SHEET ALL AROUND THE CHIMNEY
MINIMUM HEIGHT OF FLASHING 1.5 TIMES SHINGLE EXPOSURE BUT NOT LESS THAN 1/6 WIDTH OF CHIMNEY AND NOT LESS THAN 150mm (6")
FLASHING UP ROOF SLOPE TO EXTEND TO A POINT EQUAL IN HEIGHT TO FLASHING ON MASONRY
NOTE: SADDLE IS REQUIRED BY CODE WHERE WIDTH OF UPPER SIDE OF CHIMNEY EXCEEDS 750mm (30").
ROOF PENETRATIONS – UPPER SIDE OF BRICK CHIMNEY
2.13b
1" 0 4" 8"
50mm 0 100 200mm

***Detail 2.13b:** Roof Penetrations–Upper Side of Brick Chimney*

Builder Checklist

- ❑ Masonry, roofing and sheet-metal work coordination is critical.
- ❑ The stepped base flashing is installed at the same time as the shingles and is interwoven with them.
- ❑ Stepped counter flashing is built into the masonry at the time of chimney construction or is installed into reglets left by the mason.
- ❑ All joints in the saddle, through-wall flashing and flashing at the base of the chimney are soldered or sealed watertight.
- ❑ Sealant joints
  - How will this joint work?
  - Is the weather and temperature appropriate for applying the sealant application?
  - Has the surface been cleaned and primed?
  - Are the substrate and primer materials compatible?
  - Is the joint width and depth appropriate for the expected movement?
  - Is the bond breaker or backer rod of the correct size and properly positioned?
  - Has the sealant been tooled to fill the joint without bubbles or other defects?
  - Test to ensure that sealant adheres.


SADDLE REQUIRED BY CODE WHERE WIDTH OF UPPER SIDE OF CHIMNEY EXCEEDS 750mm (6')
ONE-PIECE SADDLE
RUBBERIZED ASPHALT SHEET INSTALLED ON SHEATHING BEFORE INSTALLATION OF METAL FLASHINGS
CONNECT TO SHEATHING WITH CLEATS
SOLDERED GUSSET
SOLDERED GUSSET
PREFINISHED SHEET STEEL (0.45mm/26ga)
ONE PIECE SADDLE
FLASHING/SADDLE
STARTER SHINGLES, ONE LAYER UPSIDE DOWN, PERPENDICULAR TO SHINGLES, NAILED AT 300mm (12") o/c
150mm (6")
SHINGLES
ROOF SHEATHING
300mm (12")
RUBBERIZED ASPHALT SHEET
SADDLE SUPPORT
SEQUENCE OF INSTALLATION
ROOF PENETRATIONS – BRICK CHIMNEY SADDLE
2.13c

***Detail 2.13c:** Roof Penetrations–Brick Chimney Saddle*

DETAIL 2.14–DAMP-PROOF FLASHING–EXPOSED MASONRY WALL

PURPOSE

To intercept water immediately below the coping and direct it to the exterior, preventing leaks into the wall assembly below.

How It Works

- Water from rain, snow or ice penetrates the masonry wall below, through joints or cracks in the coping.
- Dissimilar metals in contact result in galvanic corrosion. Aluminum corrodes in contact with concrete and mortar.
- A continuous, waterproof membrane is required below jointed masonry or stone copings to prevent saturation of the wall assembly below, which could result in efflorescence and freeze-thaw damage.
- The membrane extends beyond the face of the wall forming a drip, to shed water away from the wall below, where it may otherwise result in degradation of the joints and staining.
- Some membranes can self-seal around penetrations through the membrane, such as for dowels. Others require sealing with a material compatible with the membrane.
- The coping itself is sloped away from the most critical face, where water flow would affect pedestrians or the wall assembly below.
- The underside of the coping should have a drip reglet to break the surface tension, to prevent water from flowing back onto the wall.

Designer Checklist

❑ Avoid placing aluminum in contact with concrete and mortar. Avoid placing dissimilar metals in contact with each other.

❑ Membrane materials are shown to be continuous across all openings.
- Type of sealant or mastic around penetrations is specified.

❑ A drip-edge projection is specified to shed water away from the wall below.

❑ Ensure holes are provided at bottom of wall cavity.

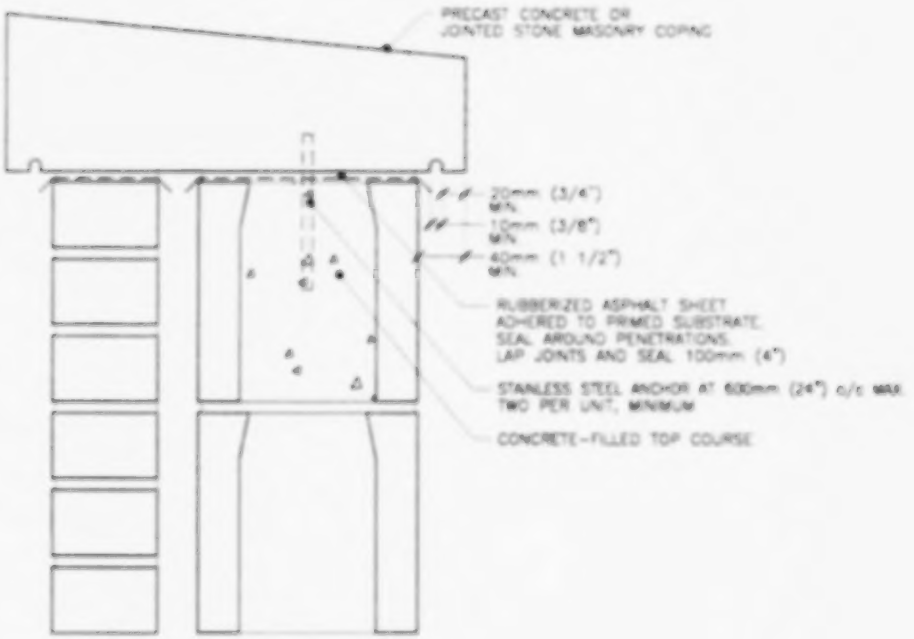
Builder Checklist

❑ Joints in the membrane are avoided.
- If joints cannot be avoided, they are lapped (minimum 100 mm [4 in.]) and sealed.

❑ Stagger the joints in the flashing with joints in the coping.

❑ The flashing is sealed around penetrations before the coping is installed.

❑ The flashing is extended beyond the face of the wall below to form a drip. Do not cut off the exposed edges of membrane flashings.



DAMP–PROOF FLASHING – EXPOSED MASONRY WALL 2.14

***Detail 2.14**: Damp-proof Flashing–Exposed Masonry Wall*

DETAIL 2.15–FOUNDATION WALL–STUCCO VENEER

PURPOSE

To redirect water flowing down the exterior face of the wall to flow away from the foundation wall.

How It Works

- The flashing serves both as a drip edge and plaster guard or metal trim.
- The flashing is extended beyond the face of the foundation below the wall and forms a drip to shed water away from the foundation wall surface below.

Designer Checklist

❑ Galvanized or stainless steel flashing and fasteners are specified. Aluminum will react with the stucco cement.

❑ Mechanical fasteners are specified at regular intervals, maximum 300 mm (12 in.) on centre, for tight contact between the flashing and the sheathing.

Builder Checklist

❑ Flashing is installed before the building paper or housewrap is installed.

❑ Building paper or house wrap and stucco lath are lapped over the vertical leg of the flashing.

❑ The flashing is properly fastened to the wall sheathing at sufficient intervals to get a tight fit.

❑ Joints in the flashing are lapped (minimum 100 mm [4 in.]) and sealed.

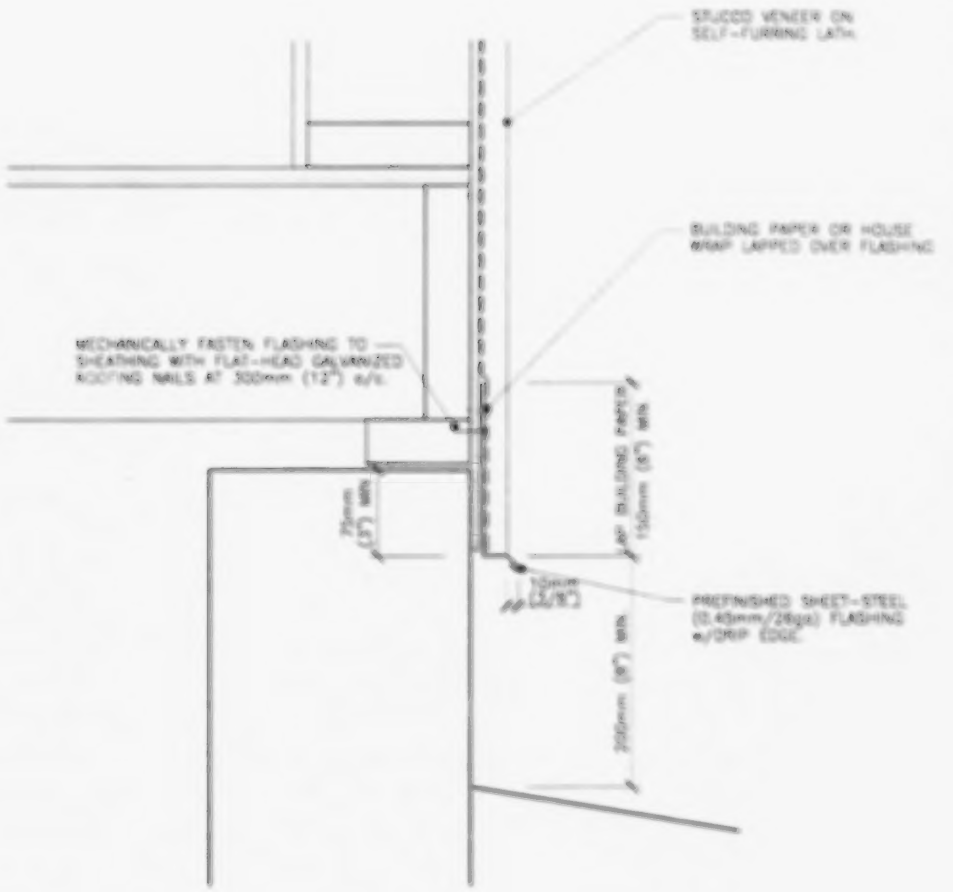
❑ The bottom of the flashing is extended below the top of the foundation wall to cover the sill joint.

❑ Flashing is continuous at the corners.

❑ End dams are provided at openings.

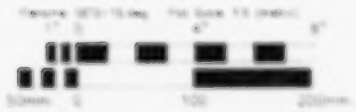
❑ The horizontal leg of flashing is mitred at the corners.

❑ Vertical legs are lapped at the corner to provide continuity at the corners.



FOUNDATION WALL – STUCCO VENEER

2.15



Detail 2.15: Foundation Wall–Stucco Veneer

DETAIL 2.16–WINDOW/DOOR HEAD–STUCCO VENEER

PURPOSE

To redirect water flowing down the exterior face of the wall to flow away from the wall opening.

How it Works

- The flashing serves both as a drip edge and plaster guard or metal trim.
- The flashing is extended beyond the exterior face of the window/door assembly below and forms a drip to shed water away from joints and window/door materials.

Designer Checklist

❑ Galvanized metal or stainless steel flashing and fasteners are specified. Aluminum will react with the stucco cement.

❑ Mechanical fasteners are specified at regular intervals, maximum 300 mm (12 in.) on centre, for tight contact between the flashing and the sheathing.

❑ Air barrier sealant, gasket or adhesive membrane is applied to the frames of all door, window and other penetrations to prevent air leakage through the wall at these junctions.

Builder Checklist

❑ The flashing is installed before the moisture barrier is installed.

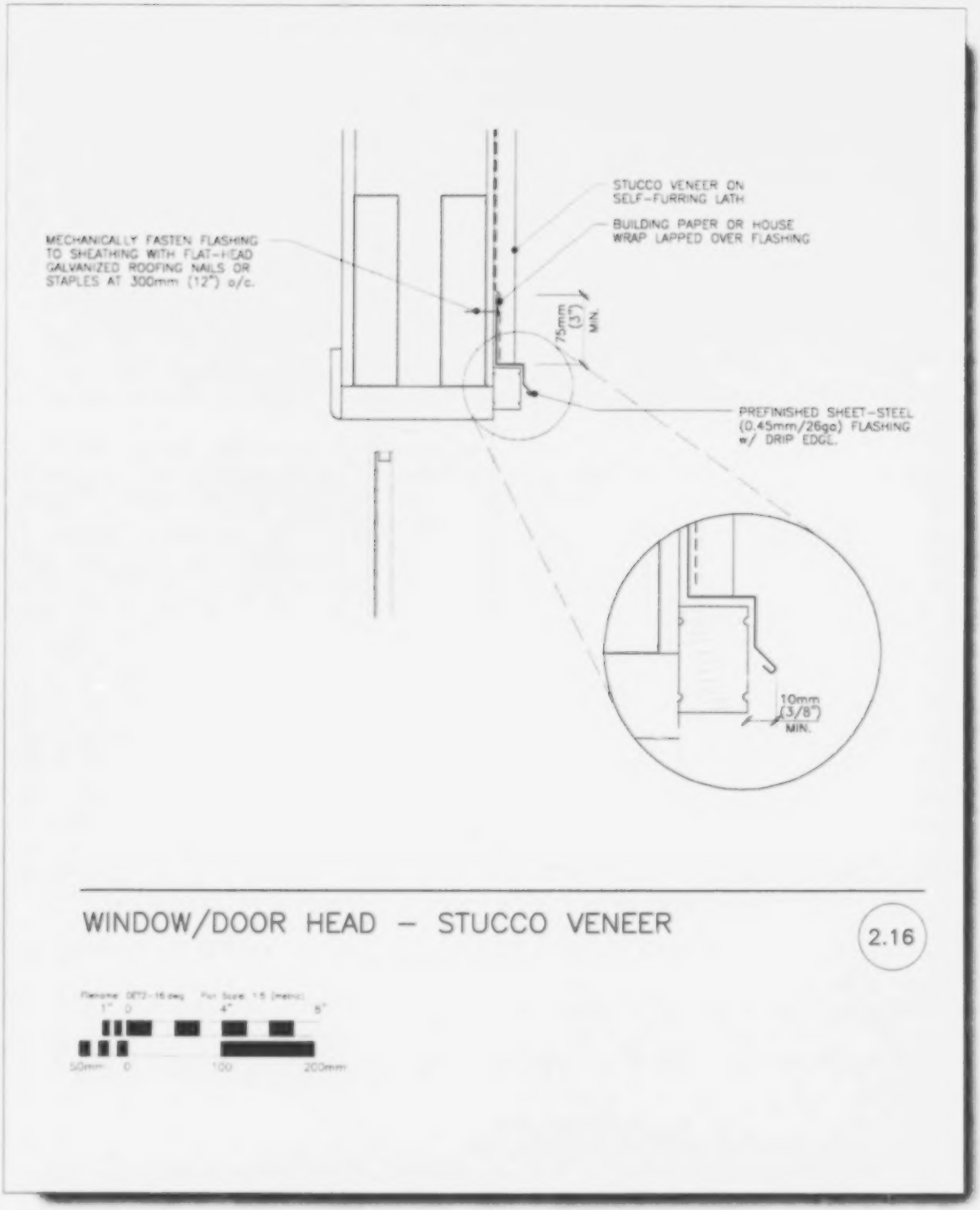
❑ The moisture barrier and stucco lath are lapped over the vertical leg of the flashing or trim.

❑ The flashing is properly fastened to the wall sheathing at sufficient intervals to get a tight fit.

❑ Joints in the flashing are lapped (minimum 100 mm [4 in.]) and sealed.

❑ The drip-edge projection is maintained.

❑ The gap between the window/door frame and the underside of the drip edge is clear of sealant.


MECHANICALLY FASTEN FLASHING TO SHEATHING WITH FLAT-HEAD GALVANIZED ROOFING NAILS OR STAPLES AT 300mm (12") o/c.
STUCCO VENEER ON SELF-FURRING LATH
BUILDING PAPER OR HOUSE WRAP LAPPED OVER FLASHING
75mm (3") MIN.
PREFINISHED SHEET-STEEL (0.45mm/26ga) FLASHING w/ DRIP EDGE.
10mm (3/8") MIN.
WINDOW/DOOR HEAD – STUCCO VENEER
2.16

Detail 2.16: Window/Door Head–Stucco Veneer

DETAIL 2.17–FOUNDATION WALL–VINYL, ALUMINUM SIDING

PURPOSE

To intercept water behind the siding and direct it to the outside, away from the foundation wall.

How It Works

- Moisture may enter the cavity as a result of:
  - rain penetration through the siding
  - water vapour diffusion
  - leakage of moist air from the interior
- Building paper or house wrap (inside the cavity) acts as a barrier to rain penetration into the inner layer of the wall.

Designer Checklist

❑ A horizontal siding application is shown, with a combination of starter strip and bottom siding panel to direct the water to the outside.

❑ For vertical siding applications, a separate base trim is specified to act as flashing and also to close the openings at the bottom of the siding profile.

❑ The flashing is shown to have a drip-edge projection.

❑ Mechanical fasteners are specified at regular intervals, maximum 300 mm (12 in.) on centre, to ensure tight contact between the starter strip/flashing and the sheathing.

❑ Ensure that corners and end dams at openings are detailed.

Builder Checklist

❑ Flashing is installed before the moisture barrier is installed.

❑ Building paper or house wrap is lapped over the vertical leg of starter strip/flashing and fasteners.

❑ The starter strip/flashing is properly fastened to the wall sheathing at sufficient intervals to provide a tight fit.

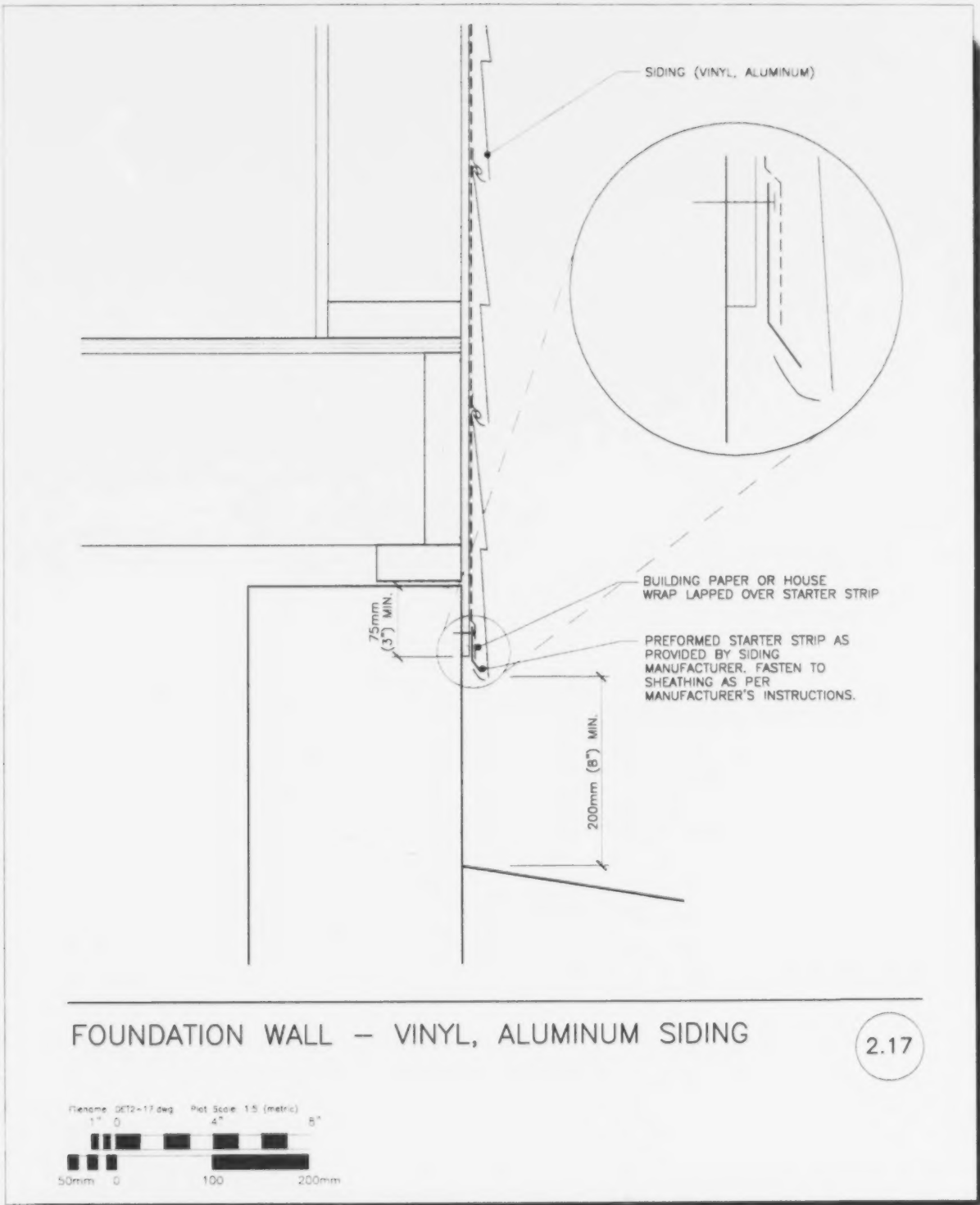
❑ Joints in the starter strip/flashing are properly lapped (minimum 100 mm [4 in.]).

❑ The bottom of the starter strip/flashing is extended below the top of the foundation wall, a minimum of 75 mm (3 in.), to cover the joint.

❑ For vertical siding applications, the joint between the flashing and the bottom of the siding is left open for drainage.

❑ Flashing is continuous at the corners.

❑ End dams are provided at openings.


SIDING (VINYL, ALUMINUM)
BUILDING PAPER OR HOUSE WRAP LAPPED OVER STARTER STRIP
PREFORMED STARTER STRIP AS PROVIDED BY SIDING MANUFACTURER. FASTEN TO SHEATHING AS PER MANUFACTURER'S INSTRUCTIONS.
75mm (3") MIN.
200mm (8") MIN.
FOUNDATION WALL – VINYL, ALUMINUM SIDING
2.17
Filename: DET2-17.dwg Plot Scale: 1:5 (metric)
1" 0 4" 8"
50mm 0 100 200mm

Detail 2.17: Foundation Wall–Vinyl, Aluminum Siding

DETAIL 2.18–FOUNDATION WALL–AT PRECAST STEPS

PURPOSE

To limit water damage to the wood structure.

How It Works

- The wall sheathing below the door sill and the joint with the foundation wall is treated with a waterproof, flexible, self-sealing composite membrane to prevent water leaking into the building.
- The exposed section of the flexible membrane is covered by metal flashing to protect it from impact damage and UV radiation. Unexposed wall sections may be protected with other materials, such as protection board.
- The drip at the door sill limits the amount of water flowing back to the face of the wall by breaking the surface tension.
- Provide sealant at the underside of the door sill to stop air infiltration.
- The flashing prevents water penetration and staining of the wall below the door sill.
- Dissimilar metals in contact result in galvanic corrosion. Aluminum corrodes in contact with concrete and mortar.

Designer Checklist

❑ For vinyl and aluminum siding, the sill flashing is specified to be preformed by the siding manufacturer.

❑ For wood siding, prefinished sheet steel is specified.

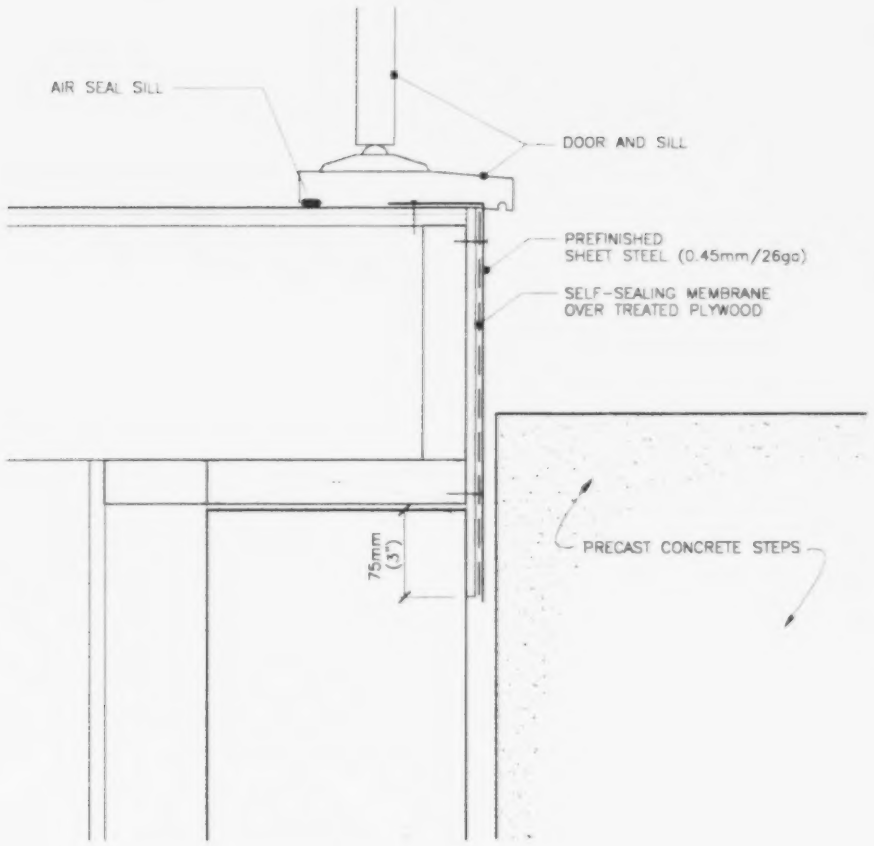
❑ Specify colour and thickness of sheet metal.

❑ Avoid placing aluminum in contact with concrete and mortar. Avoid placing dissimilar metals in contact with each other.

Builder Checklist

❑ Do not fill the drip-edge projection with sealant.

❑ The flexible membrane is protected.



FOUNDATION WALL – AT PRECAST STEPS

2.18

Filename: DET2-18.dwg Plot Scale: 1:5 (metric)
1" 0 4" 8"
50mm 0 100 200mm

Detail 2.18: Foundation Wall–At Precast Steps

DETAIL 2.19–WINDOW SILL–WOOD, VINYL, ALUMINUM SIDING

PURPOSE

To limit the amount of water flowing back onto the wall.

How It Works

- The sill/drip flashing at the underside of the window sill limits the amount of water flowing back to the face of the wall, by breaking the surface tension. Sealant at the underside of the window will eliminate air infiltration.
- The flashing limits staining of the wall below the window, as well as limiting water penetration behind the exterior cladding.
- The flashing also acts as a closing trim, particularly for vinyl and aluminum siding.
- Air barrier sealant, gasket or adhesive membrane is applied to the frames of all door, window and other penetrations to prevent air leakage through the wall at these junctions.
- Dissimilar metals in contact result in galvanic corrosion. Aluminum corrodes in contact with concrete and mortar.

Designer Checklist

❑ For vinyl and aluminum siding, the flashing is specified to be preformed by the siding manufacturer.

❑ For wood siding, prefinished sheet steel is specified, complete with drip edge.

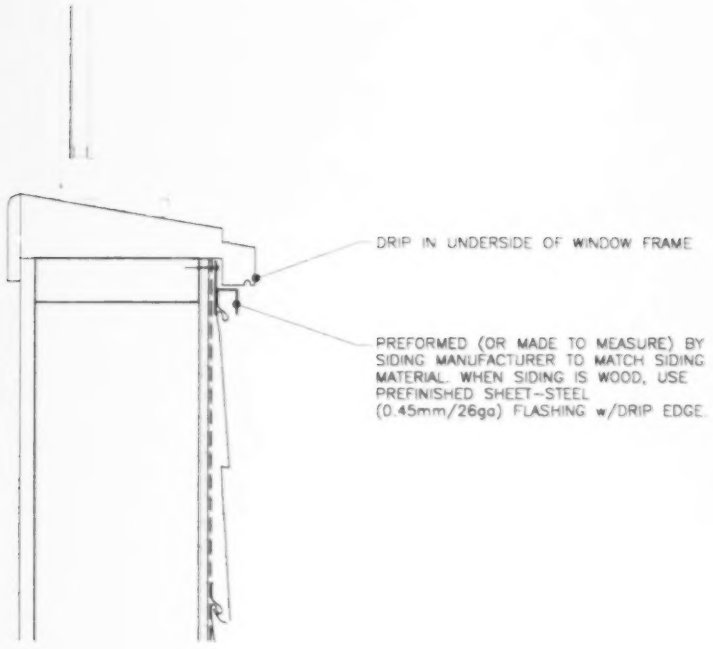
❑ Colour and thickness of sheet metal are specified.

❑ Avoid placing aluminum in contact with concrete and mortar. Avoid placing dissimilar metals in contact with each other.

Builder Checklist

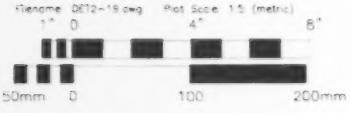
❑ If joints in the flashing cannot be avoided, the flashing sections are lapped (minimum 100 mm [4 in.]) and sealed.

❑ Do not fill the drip edge projection with sealant.


DRIP IN UNDERSIDE OF WINDOW FRAME
PREFORMED (OR MADE TO MEASURE) BY SIDING MANUFACTURER TO MATCH SIDING MATERIAL. WHEN SIDING IS WOOD, USE PREFINISHED SHEET–STEEL (0.45mm/26ga) FLASHING w/DRIP EDGE.

WINDOW SILL – WOOD, VINYL, ALUMINUM SIDING

2.19



Detail 2.19: *Window Sill–Wood, Vinyl, Aluminum Siding*

DETAIL 2.20–WINDOW/DOOR HEAD–WOOD, VINYL, ALUMINUM SIDING

PURPOSE

To intercept water behind the siding and direct it to the outside, and to redirect water flowing down the face of the wall to flow away from the wall opening.

How It Works

- Moisture may enter the cavity as a result of:
  - rain penetration through the siding
  - water vapour diffusion
  - leakage of moist air from the interior
- Some of the moisture will drain through the weepholes or gaps at the bottom of each siding panel.
- An additional head trim flashing is required at the head of the window/door to direct water further outward, beyond the thickness of the window/door frame, which protrudes from the face of the wall.
- Dissimilar metals in contact result in galvanic corrosion. Aluminum corrodes in contact with concrete and mortar.

Designer Checklist

❑ For vinyl and aluminum siding:
  - The head trim/flashing is typically preformed by the siding manufacturer.
  - The flashing projection is specified.

❑ For wood siding, prefinished galvanized sheet steel is specified, complete with drip edge.

❑ Colour and thickness of sheet steel are specified.

❑ Avoid placing aluminum in contact with concrete and mortar. Avoid placing dissimilar metals in contact with each other.

❑ Mechanical fasteners are specified at regular intervals, maximum 300 mm (12 in.) on centre, for tight contact between the head flashing and the sheathing.

❑ Air barrier sealant, gasket or adhesive membrane is applied to the frames of all door, window and other penetrations to prevent air leakage through the wall at these junctions.

Builder Checklist

❑ Flashing is installed before the starter strip and moisture barrier are installed.

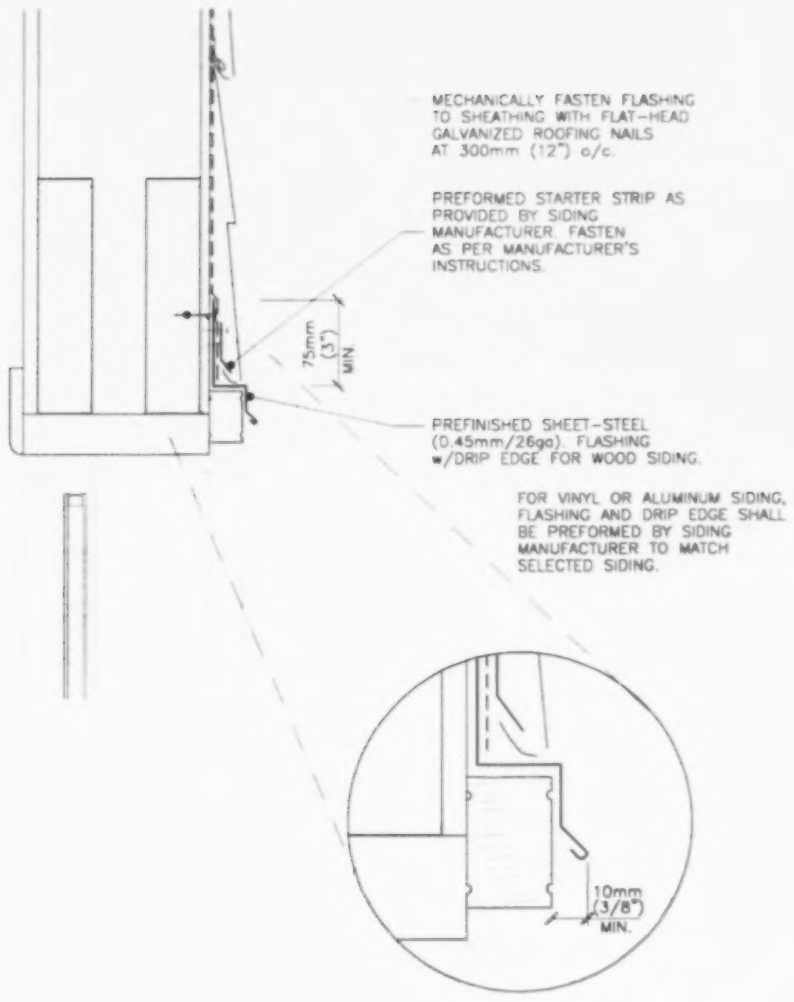
❑ The moisture barrier is lapped over the vertical leg of the head trim/flashing or over the starter strip.

❑ The head flashing is fastened to the wall sheathing at sufficient intervals to obtain a tight fit.

❑ Joints in the head flashing are avoided.
  - If joints cannot be avoided, they are lapped (minimum 100 mm [4 in.]) and sealed.

❑ The drip edge is kept free of sealant.

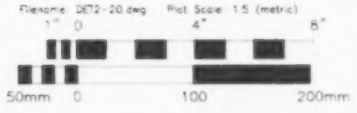
For vertical siding applications, the joint between the flashing and the bottom of the siding is left open for drainage.


MECHANICALLY FASTEN FLASHING TO SHEATHING WITH FLAT-HEAD GALVANIZED ROOFING NAILS AT 300mm (12") o/c.
PREFORMED STARTER STRIP AS PROVIDED BY SIDING MANUFACTURER. FASTEN AS PER MANUFACTURER'S INSTRUCTIONS.
75mm (3") MIN
PREFINISHED SHEET-STEEL (0.45mm/26ga). FLASHING w/DRIP EDGE FOR WOOD SIDING.
FOR VINYL OR ALUMINUM SIDING, FLASHING AND DRIP EDGE SHALL BE PREFORMED BY SIDING MANUFACTURER TO MATCH SELECTED SIDING.
10mm (3/8") MIN.

WINDOW/DOOR HEAD – WOOD, VINYL, ALUMINUM SIDING

2.20

Filename: DET2-20.dwg Plot Scale: 1:5 (metric)



***Detail 2.20:** Window/Door Head–Wood, Vinyl, Aluminum Siding*

DETAIL 2.21–OVERHANG–WOOD, VINYL, ALUMINUM SIDING

PURPOSE

To intercept water behind the siding and direct it to the outside.

How It Works

- Moisture may enter the cavity as a result of:
  - rain penetration through the siding
  - water vapour diffusion from the interior
  - air leakage from the interior
- Wall sheathing (building paper or house wrap) acts as a moisture barrier within the wall.
- In horizontal siding applications, some of the moisture behind the siding will drain out through the weepholes at the bottom of each siding panel. Moisture draining to the bottom of the wall is intercepted and directed to the outside by the combination of starter strip and bottom siding panel, which fulfil the function of flashing.
- The location of the weepholes, on the outer face of the siding panel, ensures that water drains out away from the wall surface below.
- Dissimilar metals in contact result in galvanic corrosion. Aluminum corrodes in contact with concrete and mortar.

Designer Checklist

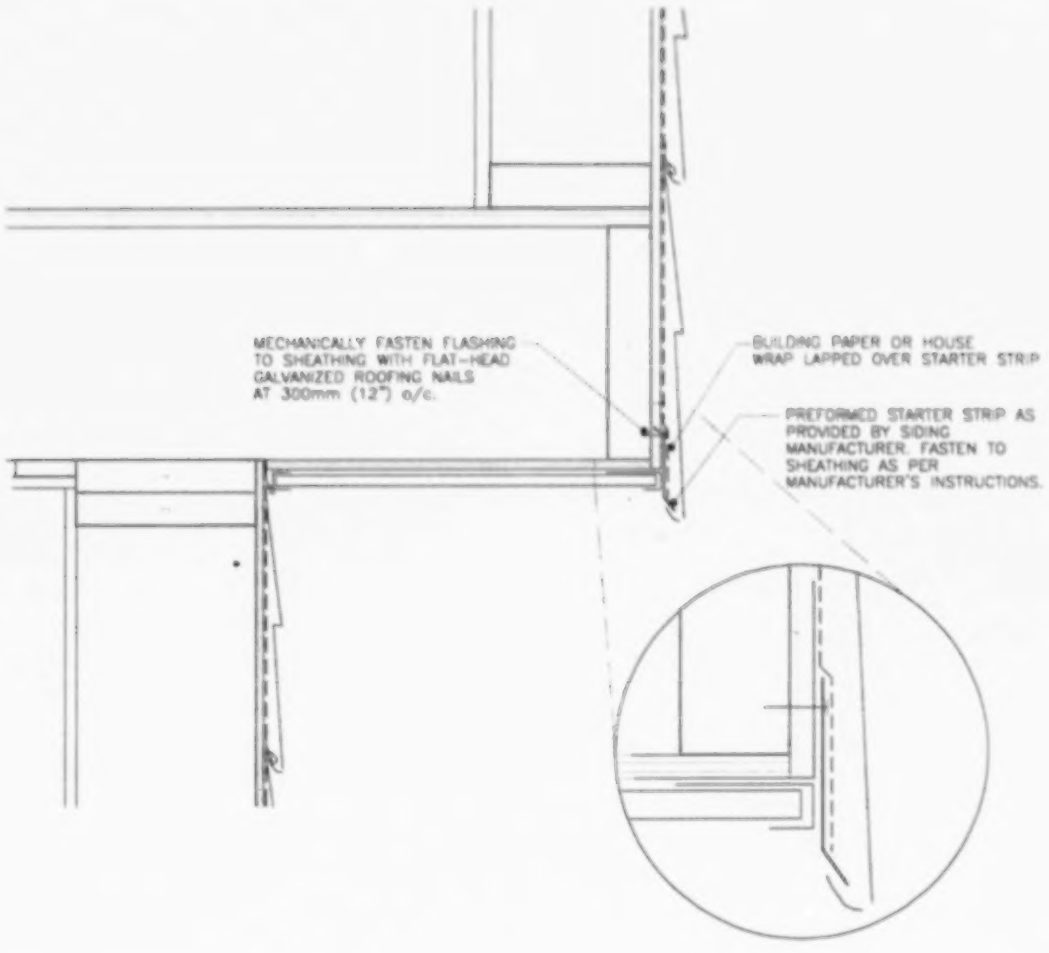
❑ A horizontal siding application includes a combination of starter strip and bottom siding panel to direct the water to the exterior. Consider the use of an additional flashing complete with drip edge to limit the amount of water flowing back along the soffit which may result in staining and deterioration of the soffit.

For vertical siding applications:

- A separate base trim is required to act as flashing and also to close the openings at the bottom of the siding profile.
- The flashing has a drip-edge projection.

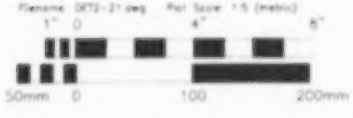
❑ Flashings may be prefinished metal, cut and shaped on site, or vinyl or aluminum preformed by the siding manufacturer. Avoid placing aluminum in contact with concrete and mortar. Avoid placing dissimilar metals in contact with each other.

❑ Mechanical fasteners are specified at regular intervals, maximum 300 mm (12 in.) on centre, to ensure tight contact between the starter strip/flashing and the sheathing.


MECHANICALLY FASTEN FLASHING TO SHEATHING WITH FLAT-HEAD GALVANIZED ROOFING NAILS AT 300mm (12") o/c.
BUILDING PAPER OR HOUSE WRAP LAPPED OVER STARTER STRIP
PREFORMED STARTER STRIP AS PROVIDED BY SIDING MANUFACTURER. FASTEN TO SHEATHING AS PER MANUFACTURER'S INSTRUCTIONS.

OVERHANG – WOOD, VINYL, ALUMINUM SIDING

2.21



***Detail 2.21:** Overhang–Wood, Vinyl, Aluminum Siding*

Builder Checklist

- ❑ Flashings must be installed before the starter strip and building paper are installed.
- ❑ If no additional drip flashing is used, the building paper is lapped over the starter strip/flashing and fasteners.
- ❑ The starter strip/flashing is fastened to the wall sheathing at sufficient intervals to get a tight fit.
- ❑ Joints in the flashing are lapped (minimum 100 mm [4 in.]) and sealed.
- ❑ Alignment of the flashing is coordinated with soffit positioning.
- ❑ The flashing covers the exterior edge of the soffit.

DETAIL 2.22a–FLAT ROOF/WALL ABOVE (TERRACE)–WOOD, VINYL, ALUMINUM SIDING

DETAIL 2.22b–FLAT ROOF/DOOR SILL (TERRACE)–WOOD, VINYL, ALUMINUM SIDING

PURPOSE

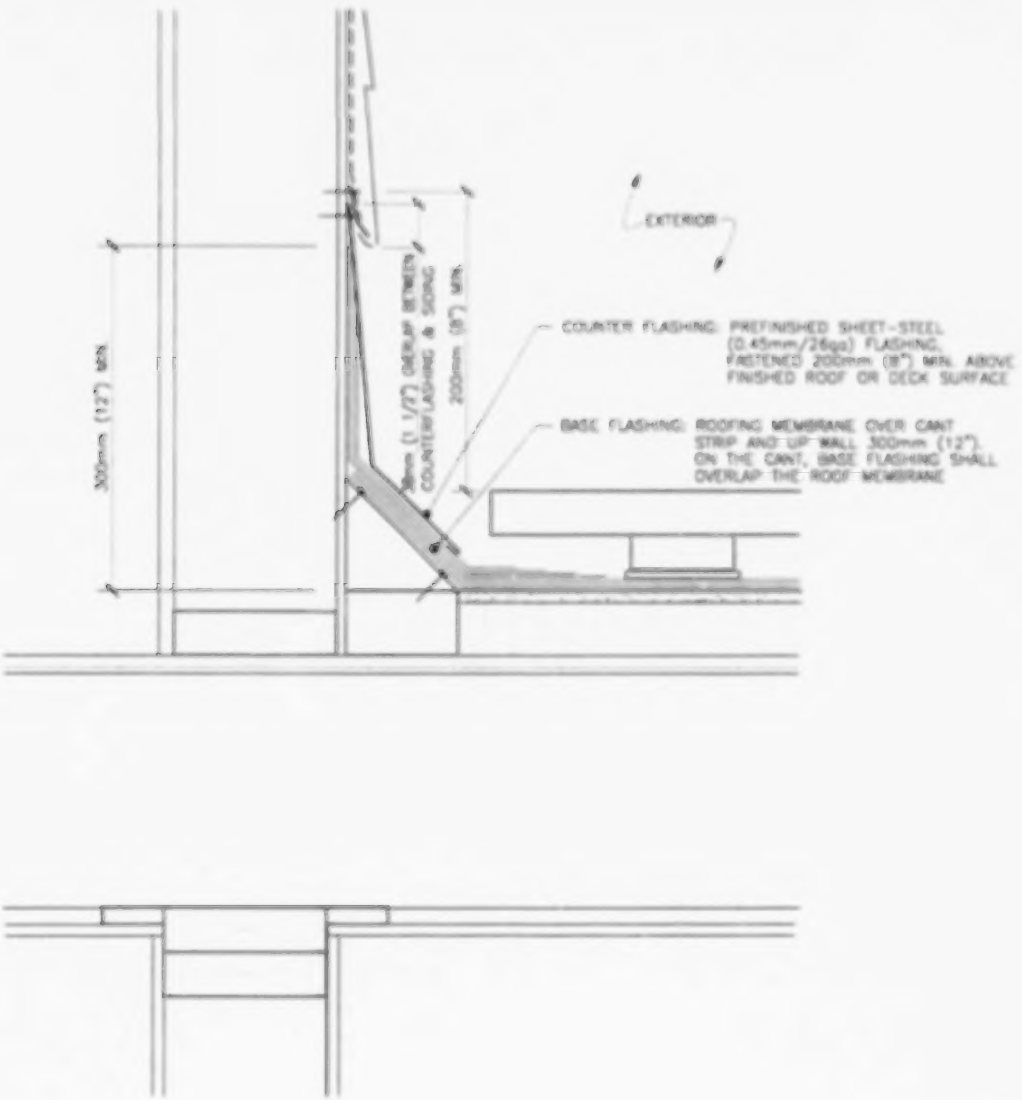
To provide a waterproof transition between the roofing membrane and the wall.

How It Works

- Roofing membrane is turned up onto the wall to prevent water penetration, in the event of ponding or snow and ice accumulation at the roof-wall junction.
- Membrane base flashing extends from the roof membrane up under the wall sheathing paper to prevent water behind the cladding penetrating behind the roof membrane upturn.
- Metal counter flashing protects the base flashing and roof membrane upturn from impact and deterioration due to exposure to UV radiation.

Designer Checklist

- ❑ Ensure details around doors are shown on the drawings.
- ❑ Specify membrane base flashing type and installation method according to type of roof membrane.
- ❑ Type, thickness and colour of base and counter flashing materials are specified.
- ❑ Metal flashing connections are detailed to allow for easy removal for inspection of base flashing and for roof replacement.
- ❑ Slope of terrace structure is specified to drain water away from the wall.


EXTERIOR
COUNTER FLASHING: PREFINISHED SHEET-STEEL (0.45mm/26ga) FLASHING, FASTENED 200mm (8") MIN. ABOVE FINISHED ROOF OR DECK SURFACE
BASE FLASHING: ROOFING MEMBRANE OVER CANT STRIP AND UP WALL 300mm (12"). ON THE CANT, BASE FLASHING SHALL OVERLAP THE ROOF MEMBRANE
38mm (1 1/2") OVERLAP BETWEEN COUNTERFLASHING & SIDING
200mm (8") MIN.
300mm (12") MIN.

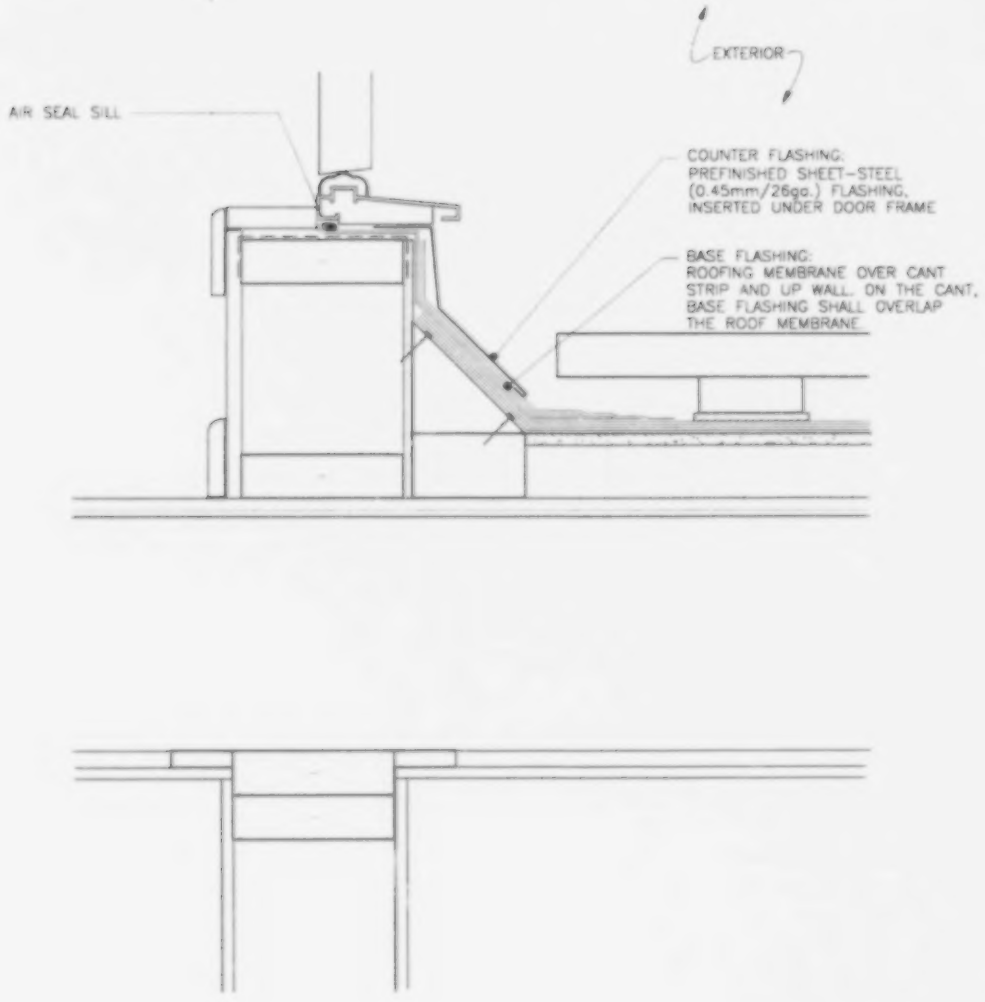
FLAT ROOF/WALL ABOVE (TERRACE) – WOOD, VINYL, ALUMINUM SIDING

2.22a

Detail 2.22a: Flat Roof/Wall Above (Terrace)–Wood, Vinyl, Aluminum Siding

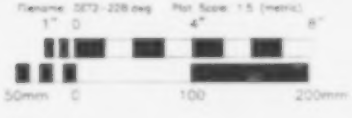
Builder Checklist

- ❑ Membrane flashing/base flashing is installed in accordance with roofing specifications.
- ❑ Roof membrane upturn, base flashing and counter flashing are installed before wall sheathing paper and wall siding are installed.
- ❑ The counter flashing is fastened to the wall above the roof membrane upturn to reduce the likelihood of leaks.



FLAT ROOF/DOOR SILL (TERRACE) – WOOD, VINYL, ALUMINUM SIDING

2.22b



***Detail 2.22b:** Flat Roof/Door Sill (Terrace)–Wood, Vinyl, Aluminum Siding*

DETAIL 2.23–MEDIUM/HIGH PARAPET–PREFINISHED VENEER

PURPOSE

To prevent water from penetrating the interior of the building, wall cavity and roofing system.

How It Works

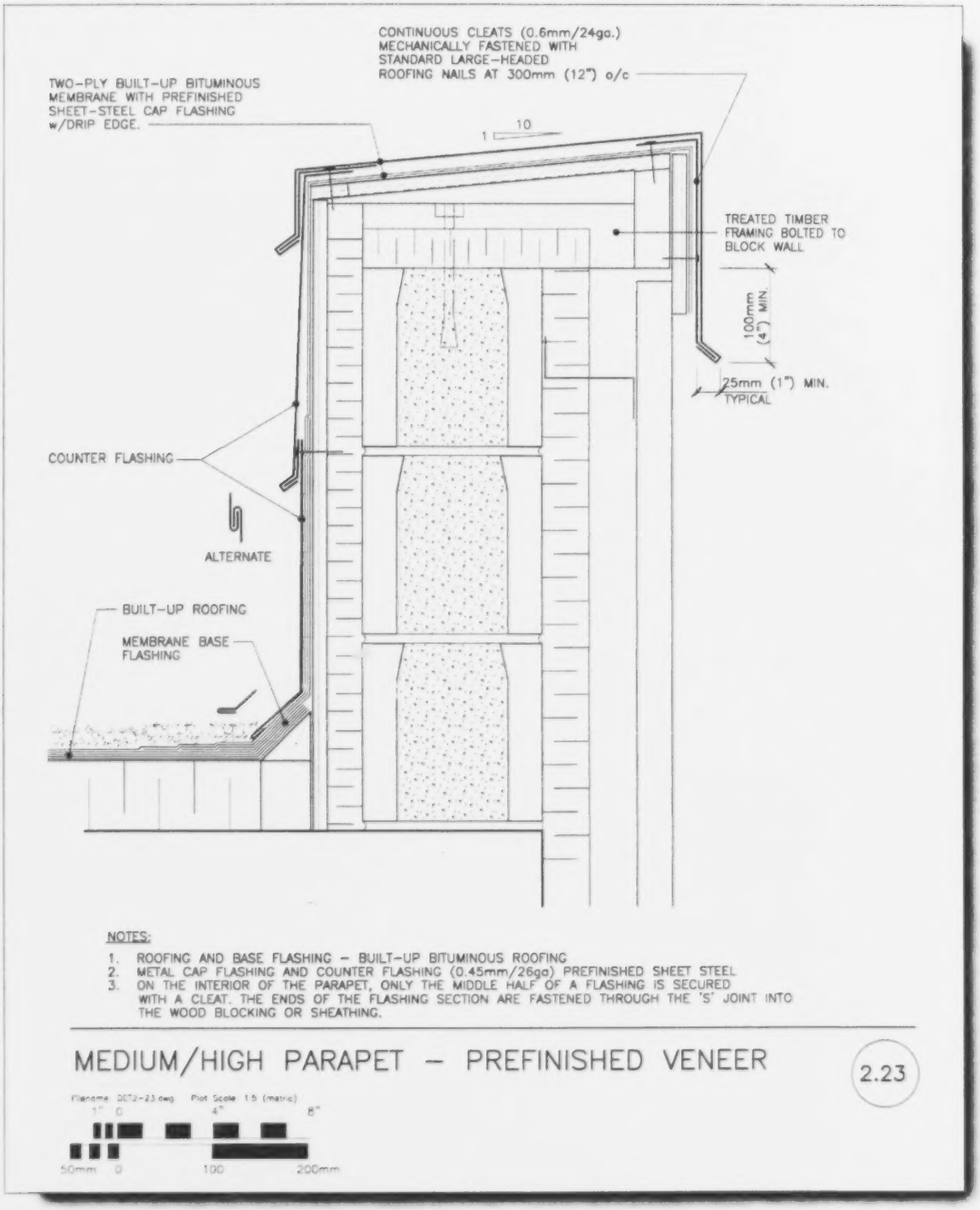
- The roofing membrane is turned up the cant, where it is lapped by a separate base flashing membrane, which extends over the parapet to the exterior face of the wall. There it is fastened to the wood blocking.
- This base flashing membrane constitutes the primary waterproofing along the edge of the roof and the parapet wall. It may be built up of several plies of the same material as that of the roofing membrane, or it may consist of a different but compatible material.
- The flashing must be adequately supported by the wood blocking because the top of the parapet wall can be subject to foot traffic during window washing and other activities requiring staging.
- The cant is used to ease the membrane into the change in direction. It is required for built-up roofing membranes and recommended for other types of roofing membranes.
- The membrane base flashing is covered by metal counter flashing along the interior perimeter of the roof and by cap flashing over the parapet to protect it from impact damage and UV radiation.
- The cap flashing is sloped toward the roof to prevent water from flowing toward the exterior face of the wall, thus minimizing wetting of the veneer below, and protecting pedestrians at ground level.
- The metal cap flashing extends down the exterior face of the wall, a minimum of 100 mm (4 in.) below the wood blocking. It includes a drip-edge projection to direct water draining off the metal out and away from the wall surfaces below.

Designer Checklist

- ❑ Cap flashings must be jointed to account for thermal movements of the metal.
- ❑ S-joints in the metal flashing are specified, with no exposed fasteners.
- ❑ Ensure adequate provision for differential movement between the metal flashing and the exterior wall cladding.
- ❑ Roof flashings are designed to allow easy removal for roof replacement.

Builder Checklist

- ❑ Coordination is required between cladding and roofing trades.
- ❑ Flashings are adequately protected from damage during construction.
- ❑ If metal siding is used as the exterior cladding, closure strips matching the siding profile are also provided to cover the underside of the wood blocking.


CONTINUOUS CLEATS (0.6mm/24ga.)
MECHANICALLY FASTENED WITH
STANDARD LARGE–HEADED
ROOFING NAILS AT 300mm (12") o/c
TWO–PLY BUILT–UP BITUMINOUS
MEMBRANE WITH PREFINISHED
SHEET–STEEL CAP FLASHING
w/DRIP EDGE.
1
10
TREATED TIMBER
FRAMING BOLTED TO
BLOCK WALL
100mm
(4") MIN.
25mm (1") MIN.
TYPICAL
COUNTER FLASHING
ALTERNATE
BUILT–UP ROOFING
MEMBRANE BASE
FLASHING
NOTES:
1. ROOFING AND BASE FLASHING – BUILT–UP BITUMINOUS ROOFING
2. METAL CAP FLASHING AND COUNTER FLASHING (0.45mm/26ga) PREFINISHED SHEET STEEL
3. ON THE INTERIOR OF THE PARAPET, ONLY THE MIDDLE HALF OF A FLASHING IS SECURED WITH A CLEAT. THE ENDS OF THE FLASHING SECTION ARE FASTENED THROUGH THE 'S' JOINT INTO THE WOOD BLOCKING OR SHEATHING.
MEDIUM/HIGH PARAPET – PREFINISHED VENEER
2.23
Filename: DET2-23.dwg Plot Scale: 1:5 (metric)
1" 0 4" 8"
50mm 0 100 200mm

Detail 2.23: Medium/High Parapet–Prefinished Veneer

DETAIL 2.24–FLAT ROOF EDGE FLASHING

PURPOSE

To prevent water penetrating the interior of building, wall cavity and roofing system.

How It Works

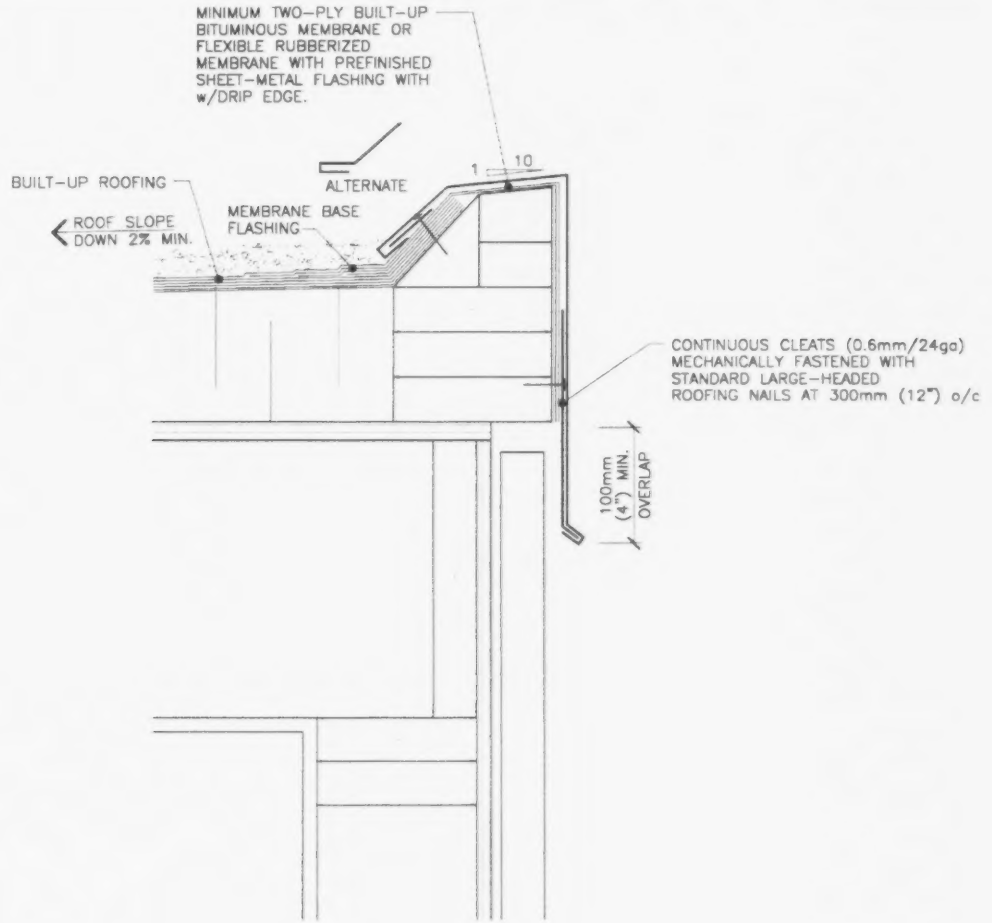
- The roofing membrane is turned up the cant, where it is lapped by a separate base flashing membrane, which extends over the roof edge to the exterior face of the wall. There it is fastened to the wood blocking.
- This base flashing constitutes the primary waterproofing along the edge of the roof and the parapet wall. It may be built up of several plies of the same material as that of the roofing membrane, or it may consist of a different but compatible material.
- The flashing must be adequately supported by the wood blocking because the top of the parapet wall can be subject to foot traffic during window washing and other activities requiring staging.
- The cant is used to ease the membrane into the change in direction. It is required for built-up roofing membranes and recommended for other types of roofing membranes.
- The membrane base flashing is covered by a metal cap flashing to protect it from impact damage and UV radiation.
- The cap flashing is sloped toward the roof to prevent water flowing toward the exterior face of the wall, thus minimizing wetting of the veneer below, and protecting pedestrians at ground level.
- The metal cap flashing extends down the exterior face of the wall, a minimum of 100 mm (4 in.) below the wood blocking. It includes a drip-edge projection to direct water draining off the metal out and away from the wall surfaces below.

Designer Checklist

- ❑ Cap flashings are shown to be jointed to account for thermal movements of the metal.
- ❑ S-joints in the metal flashing are specified, with no exposed fasteners.
- ❑ Adequate provision is made for differential movement between the metal flashing and the exterior wall cladding.
- ❑ Roof flashings are designed to allow for easy removal during roof replacement.

Builder Checklist

- ❑ Coordination is required between cladding and roofing trades.
- ❑ Flashings are adequately protected from damage during construction.
- ❑ If metal siding is used as the exterior cladding, provide closure strips matching the siding profile to cover the underside of the wood blocking.

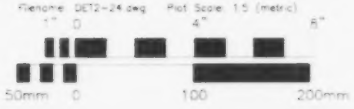

MINIMUM TWO–PLY BUILT–UP BITUMINOUS MEMBRANE OR FLEXIBLE RUBBERIZED MEMBRANE WITH PREFINISHED SHEET–METAL FLASHING WITH w/DRIP EDGE.
ALTERNATE
1
10
BUILT–UP ROOFING
ROOF SLOPE DOWN 2% MIN.
MEMBRANE BASE FLASHING
CONTINUOUS CLEATS (0.6mm/24ga) MECHANICALLY FASTENED WITH STANDARD LARGE–HEADED ROOFING NAILS AT 300mm (12") o/c
100mm (4") MIN. OVERLAP

NOTES:

1. ROOFING AND BASE FLASHING – BUILT–UP BITUMINOUS ROOFING
2. METAL CAP FLASHING AND COUNTER FLASHING (0.45mm/26ga) PREFINISHED SHEET–STEEL
3. ALTERNATIVELY, PREFINISHED ALUMINUM MAY BE USED.

FLAT ROOF EDGE FLASHING

2.24



***Detail 2.24:** Flat Roof Edge Flashing*

DETAIL 2.25–SLOPED SHINGLE ROOF EAVE

PURPOSE

To support the shingle edge and to provide a drip edge to prevent water from running back underneath the shingles and down along the fascia and soffit.

How It Works

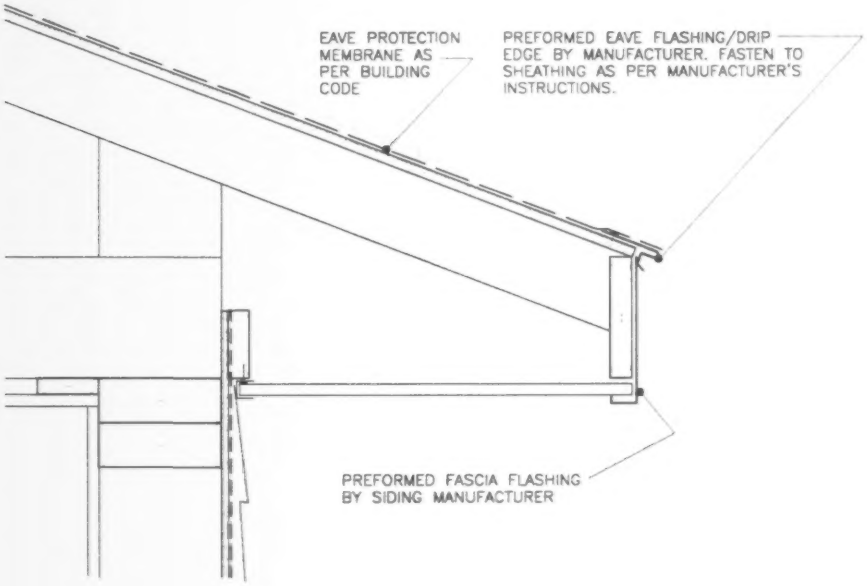
- A preformed eaves flashing/drip edge is installed under the starter course of the asphalt shingle roofing.
- Extension of flashing supports edge of shingles. If eavestroughs are used, the flashing edge also helps to direct water into troughs.
- Fascia flashing retains the soffit, protects the fascia board, and provides a drip edge at the bottom edge to direct water away from the soffit, helping to reduce maintenance requirements.
- Dissimilar metals in contact result in galvanic corrosion. Aluminum corrodes in contact with concrete and mortar.

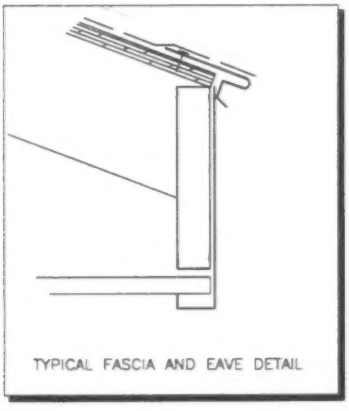
Designer Checklist

❑ Eavestroughing is detailed, if required.
❑ Type, thickness and colour of material is specified.
❑ If the fascia is wood, detail the eavestrough to allow easy removal for repainting.

Builder Checklist

❑ Fascia flashing is nailed on first.
❑ Eaves flashing/drip edge and roofing follows fascia flashing, and conceals fasteners.
❑ Eaves protection membrane laps over above flashing drip edge.
❑ Eaves flashing is secured with nails, typically 200 mm (8 in.) on centre.
❑ Nails and flashing are compatible.


EAVE PROTECTION MEMBRANE AS PER BUILDING CODE
PREFORMED EAVE FLASHING/DRIP EDGE BY MANUFACTURER. FASTEN TO SHEATHING AS PER MANUFACTURER'S INSTRUCTIONS.
PREFORMED FASCIA FLASHING BY SIDING MANUFACTURER



SLOPED SHINGLE ROOF EAVE

2.25

Filename: DET2-25.dwg Plot Scale: 1:5 (metric)
1" 0 4" 8"
50mm 0 100 200mm

Detail 2.25: Sloped Shingle Roof Eave

DETAIL 2.26a–RIDGE VENT–SLOPED SHINGLE ROOF

PURPOSE

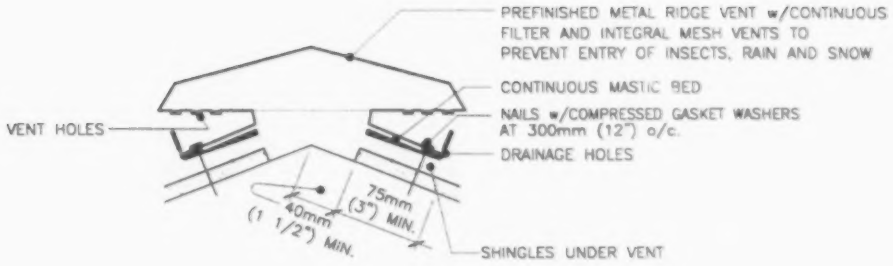
To provide roof ventilation while preventing water penetration.

How It Works

- The ridge vent is a prefabricated metal profile, designed to provide roof ventilation while protecting the top of shingled roofs. Select ridge vents carefully, ensuring that they are designed to shed water and to prevent water and snow penetration. They are also provided with insect screens to prevent entry of insects. This detail must be selected with caution since the roof and wall orientation may predispose the detail to wind-driven rain entry, or blockage by snow drifts.
- The ridge vent's metal legs are lapped over the top edge of the shingles on both sides of the roof. They are embedded in a continuous bed of mastic to prevent water wicking up through capillary action. They are fastened using nails, complete with gasket washers to prevent leakage.
- The bottom leg of the ridge vent is turned up to provide rigidity, but the upturns are provided with drainage holes.
- Various types of ridge vents are available, including some designed to be shingled over. Ventilation is then provided through baffled openings on the sides of the ridge vent. Refer to CSA Standard CAN3-A93-M92, "Natural Airflow Ventilators for Buildings."

Builder Checklist

- ❑ Ensure the roof sheathing has a gap at the top to allow ventilation, but the gap should be small enough that the shingles are still supported.
- ❑ Joints are avoided. If joints are required because of the length of the roof, appropriate connectors are used to seal the joints and prevent water from penetrating.
- ❑ The ends of the ridge vents are closed off.


PREFINISHED METAL RIDGE VENT w/CONTINUOUS FILTER AND INTEGRAL MESH VENTS TO PREVENT ENTRY OF INSECTS, RAIN AND SNOW
CONTINUOUS MASTIC BED
NAILS w/COMPRESSED GASKET WASHERS AT 300mm (12") o/c.
DRAINAGE HOLES
VENT HOLES
75mm (3") MIN.
40mm (1 1/2") MIN.
SHINGLES UNDER VENT

RIDGE VENT

2.26a

Filename: DET2-26.dwg Plot Scale: 1:5 (metric)

1" 0 4" 8"

50mm 0 100 200mm

Detail 2.26a: *Ridge Vent–Sloped Shingle Roof*

DETAIL 2.26b–ROOF TO WALL VENT–SLOPED SHINGLE ROOF

PURPOSE

To provide roof ventilation while preventing water penetration.

How It Works

- The ridge vent is a prefabricated metal profile, designed to provide roof ventilation while protecting the top of shingled roofs. Select ridge vents carefully, ensuring that they are designed to shed water and to prevent water and snow penetration. This detail must be selected with caution since the roof and wall orientation may predispose the detail to wind-driven rain entry or leakage by snow drifts.
- Vent holes are provided with insect screens to prevent entry of insects.
- The bottom leg of the ridge vent laps over the top edge of the shingle on both sides of the roof. It is embedded in a continuous bed of mastic to prevent water wicking up through capillary action, and fastened using nails complete with gasket washers to prevent leakage.
- The bottom leg of the ridge vent is typically turned up to provide rigidity, but the upturns are provided with drainage holes.
- At the roof-wall intersection, the roof vent acts as a wall flashing. The upper leg of the roof vent is lapped by the sheathing paper and the exterior wall finish.
- The sheathing paper acts as the moisture barrier within the wall. Lapping it over the top of the flashing directs water outward.

Designer Checklist

❑ Finish and colour of the roof vent are specified.

❑ Connection of the metal counter flashing is detailed to allow for easy removal.

Builder Checklist

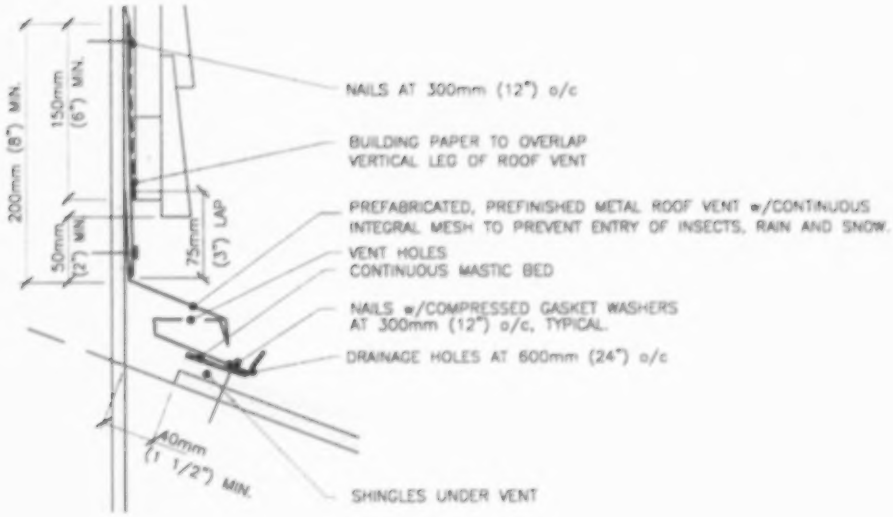
❑ The roof sheathing has a gap at the top to allow for ventilation, but the gap is small enough that the shingles are still supported.

❑ Joints are avoided, but if joints are required because of the length of the roof, appropriate connectors that allow for thermal movement are used to seal joints and prevent water penetration.

❑ The ends of the ridge vents are closed off.

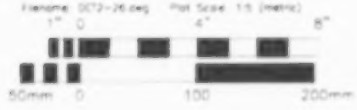
❑ Coordinate roofing and exterior cladding work.

❑ If the exterior wall cladding above the roof is masonry, the upper leg of the roof vent is sealed to the exterior face of the masonry by turning the upper leg of roof vent into a reglet.


200mm (8") MIN.
150mm (6") MIN.
50mm (2") MIN.
75mm (3") LAP
NAILS AT 300mm (12") o/c
BUILDING PAPER TO OVERLAP VERTICAL LEG OF ROOF VENT
PREFABRICATED, PREFINISHED METAL ROOF VENT w/CONTINUOUS INTEGRAL MESH TO PREVENT ENTRY OF INSECTS, RAIN AND SNOW.
VENT HOLES
CONTINUOUS MASTIC BED
NAILS w/COMPRESSED GASKET WASHERS AT 300mm (12") o/c, TYPICAL.
DRAINAGE HOLES AT 600mm (24") o/c
40mm (1 1/2") MIN.
SHINGLES UNDER VENT

ROOF TO WALL VENT – SLOPED SHINGLE ROOF

2.26b



***Detail 2.26b:** Roof to Wall Vent-Sloped Shingle Roof*

DETAIL 2.27a–SKYLIGHT–HORIZONTAL SECTION A

DETAIL 2.27b–SKYLIGHT–VERTICAL SECTION B1

DETAIL 2.27c–SKYLIGHT–VERTICAL SECTION B2 WITH SADDLE

DETAIL 2.27d–SKYLIGHT–SHOWING RUBBERIZED ASPHALT SHEET UNDERLAY

DETAIL 2.27e–SKYLIGHT–ISOMETRIC SHOWING BASE FLASHING OVER UNDERLAY

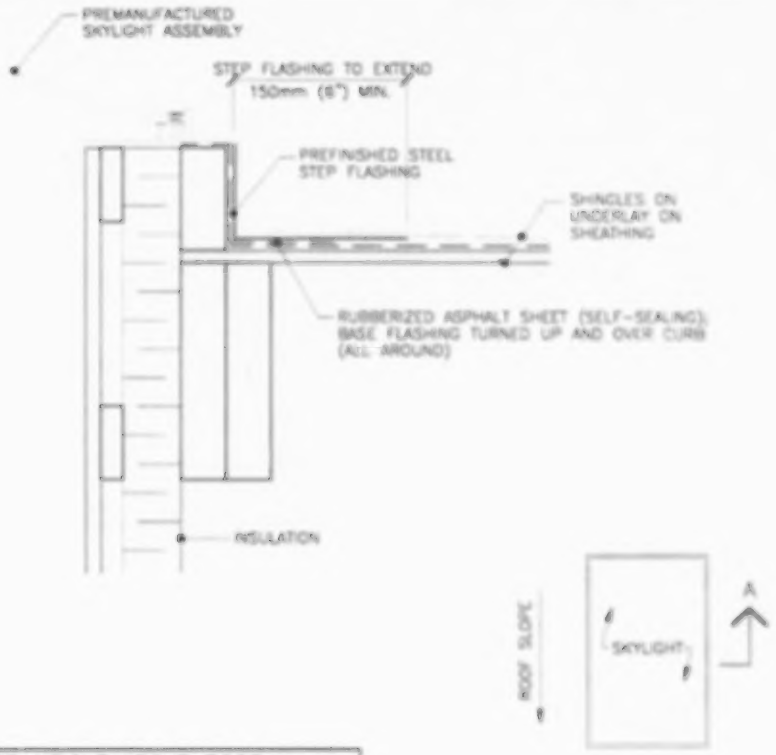
DETAIL 2.27f–SKYLIGHT–ISOMETRIC SHOWING SADDLE AND STEP FLASHING

PURPOSE

To shed water off the skylight to prevent water from penetrating through the skylight and roof connections, especially in areas with high snow buildup.

How It Works

- Flashing is an integral component of the skylight. It must be designed to seal and shed water. Flashing membranes are particularly critical in eliminating potential damage of ice damming and water buildup in places with significant accumulation of snow. Sealants should never be relied on to maintain a seal.
- Water draining down the roof surface is intercepted by the flashing at the head of the skylight (head flashing) and flows down along the step flashing on the sides of the skylight. The head flashing laps over the step flashing on the sides of the skylight and projects beyond the latter, as in the chimney detail.
- For additional water protection, a self-sealing rubberized asphalt sheet is used as an underlay around the skylight.
- Step flashing is interwoven with the shingles and fastened to the skylight frame only.
- Step flashing and counter flashing each allow differential movement between the skylight and roof.
- In cold weather, snow melting from heat loss around the skylight drains down and can refreeze downstream, causing ice damming. Water subsequently builds up behind the ice dam, ultimately penetrating below the shingles. A rubberized asphalt sheet prevents water leakage resulting from this condition (see Detail 2.27d).


PREMANUFACTURED SKYLIGHT ASSEMBLY
STEP FLASHING TO EXTEND 150mm (6") MIN.
PREFINISHED STEEL STEP FLASHING
SHINGLES ON UNDERLAY ON SHEATHING
RUBBERIZED ASPHALT SHEET (SELF-SEALING); BASE FLASHING TURNED UP AND OVER CURB (ALL AROUND)
INSULATION
ROOF SLOPE
SKYLIGHT
A

CURB HEIGHT ABOVE ROOF	
ROOF SLOPE (V:H)	HEIGHT OF BUILT-UP CURB
3:12 or less	300mm (12")
4:12	150mm (6")
5:12	100mm (4")
8:12	100mm (4")

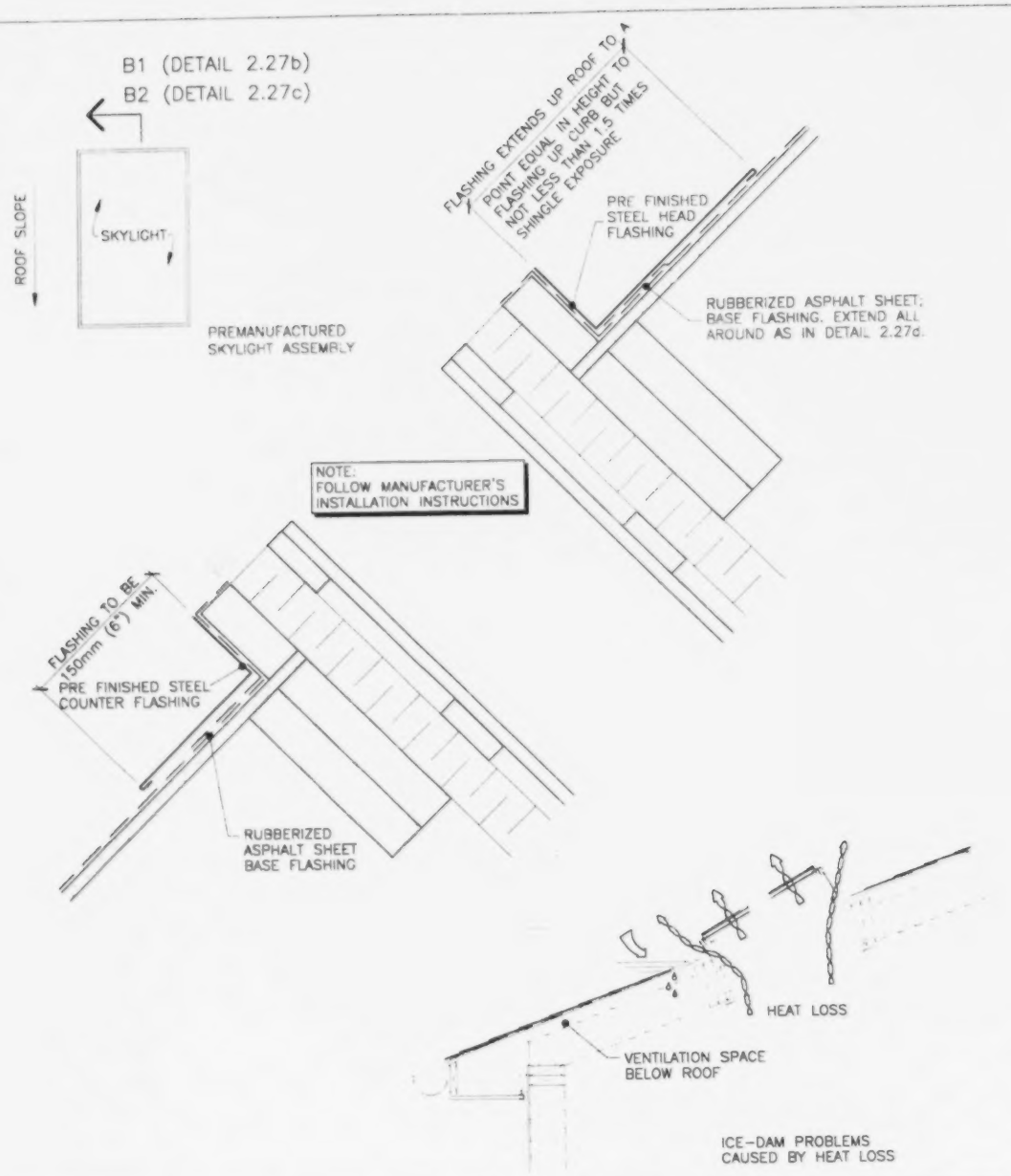
NOTE:

1. THE STEP FLASHING PIECES ARE PLACED SO THAT THEY ARE INTERWOVEN WITH EACH COURSE OF SHINGLES (i.e., INSTALLED AT THE SAME TIME AS THE SHINGLES). NAIL THE FLASHING PIECES TO THE FRAME – NOT THE ROOF.
2. ROOFING UNDERLAY TO BE FOLDED UP AGAINST ALL SIDES OF SKYLIGHT.

SKYLIGHT – HORIZONTAL SECTION A

2.27a

Detail 2.27a: Skylight–Horizontal Section A


B1 (DETAIL 2.27b)
B2 (DETAIL 2.27c)
ROOF SLOPE
SKYLIGHT
PREMANUFACTURED SKYLIGHT ASSEMBLY
FLASHING EXTENDS UP ROOF TO A POINT EQUAL IN HEIGHT TO FLASHING UP CURB BUT NOT LESS THAN 1.5 TIMES SHINGLE EXPOSURE
PRE FINISHED STEEL HEAD FLASHING
RUBBERIZED ASPHALT SHEET; BASE FLASHING. EXTEND ALL AROUND AS IN DETAIL 2.27d.
NOTE:
FOLLOW MANUFACTURER'S INSTALLATION INSTRUCTIONS
FLASHING TO BE 150mm (6") MIN.
PRE FINISHED STEEL COUNTER FLASHING
RUBBERIZED ASPHALT SHEET BASE FLASHING
HEAT LOSS
VENTILATION SPACE BELOW ROOF
ICE–DAM PROBLEMS CAUSED BY HEAT LOSS

SKYLIGHT – VERTICAL SECTION B1

(ALSO SEE ALTERNATE VERTICAL SECTION B2, DETAIL 2.27c)

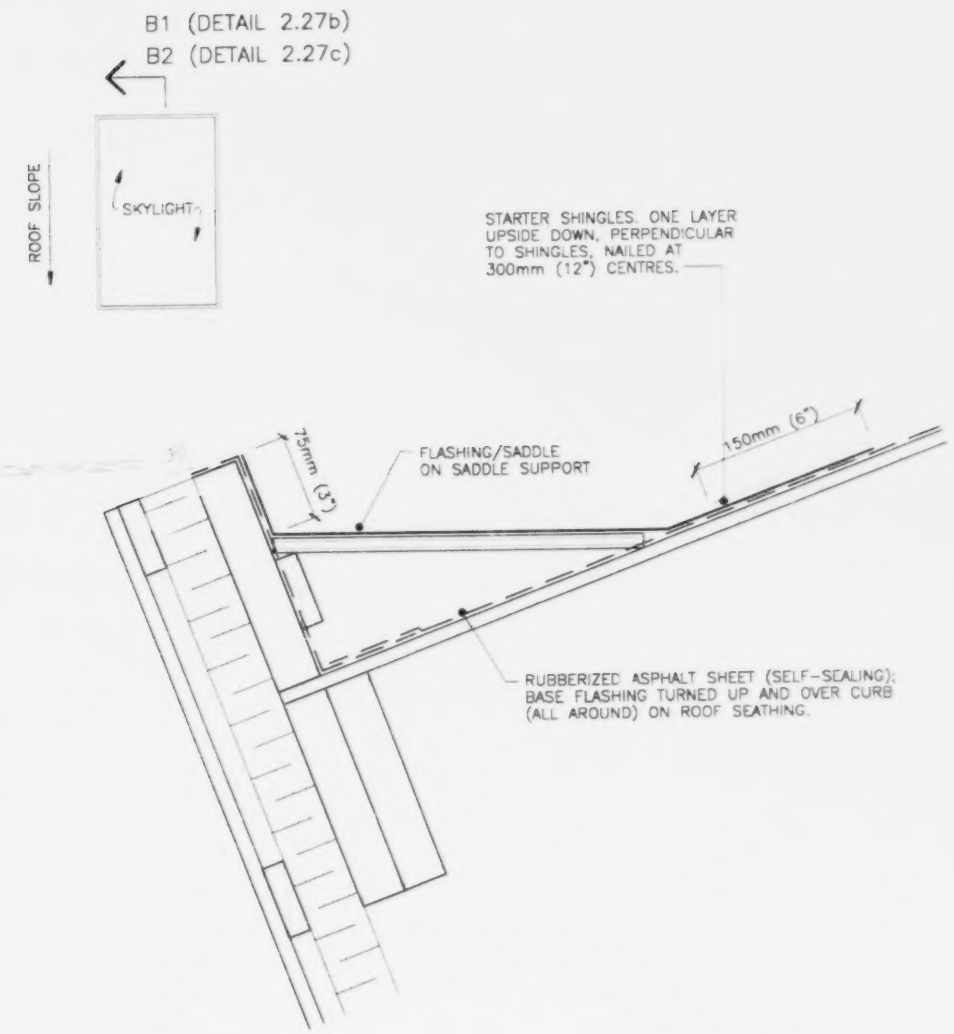
2.27b

Filename: DET2-27B.dwg Plot Scale: 1:5 (metric)

1" 0 4" 8"

50mm 0 100 200mm

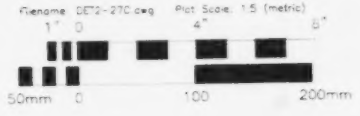
***Detail 2.27b:** Skylight–Vertical Section B1*


B1 (DETAIL 2.27b)
B2 (DETAIL 2.27c)
ROOF SLOPE
SKYLIGHT
STARTER SHINGLES, ONE LAYER UPSIDE DOWN, PERPENDICULAR TO SHINGLES, NAILED AT 300mm (12") CENTRES.
75mm (3")
FLASHING/SADDLE ON SADDLE SUPPORT
150mm (6")
RUBBERIZED ASPHALT SHEET (SELF-SEALING); BASE FLASHING TURNED UP AND OVER CURB (ALL AROUND) ON ROOF SEATHING.

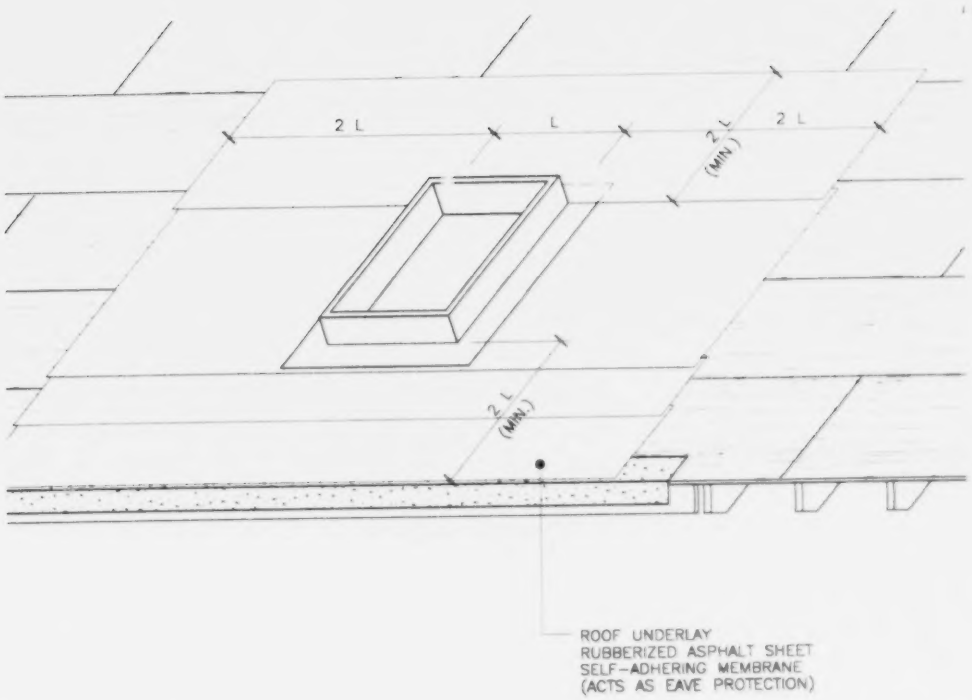
SKYLIGHT – VERTICAL SECTION B2 WITH SADDLE

(ALSO SEE ALTERNATE VERTICAL SECTION B1, DETAIL 2.27b)

2.27c



Detail 2.27c: Skylight–Vertical Section B2 With Saddle

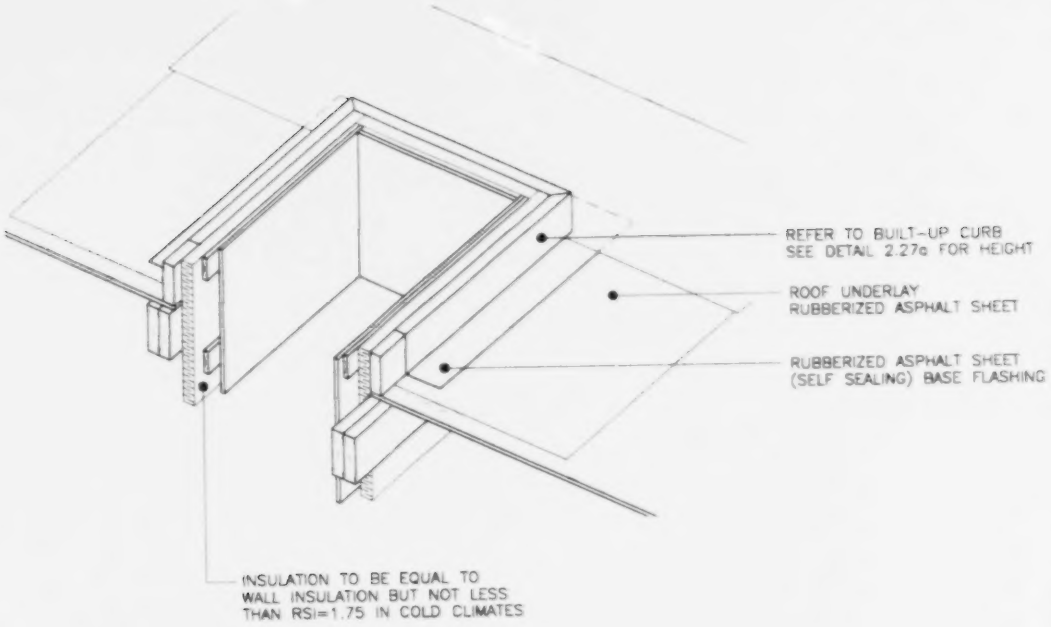


SKYLIGHT – SHOWING RUBBERIZED ASPHALT SHEET UNDERLAY 2.27d

Filename: DET2-27D.dwg Plot Scale: 1.5 (metric)

Scale: n.t.s.

Detail 2.27d: Skylight–Showing Rubberized Asphalt Sheet Underlay


REFER TO BUILT-UP CURB
SEE DETAIL 2.27a FOR HEIGHT
ROOF UNDERLAY
RUBBERIZED ASPHALT SHEET
RUBBERIZED ASPHALT SHEET
(SELF SEALING) BASE FLASHING
INSULATION TO BE EQUAL TO
WALL INSULATION BUT NOT LESS
THAN RSI=1.75 IN COLD CLIMATES

SKYLIGHT – ISOMETRIC SHOWING BASE FLASHING OVER UNDERLAY 2.27e

Filename: DET2-27E.dwg Plot Scale: 1:5 (metric)

Scale: n.t.s.

***Detail 2.27e:** Skylight–Isometric Showing Base Flashing Over Underlay*

- Ice damming can be minimized by reducing heat loss from the roof and skylight wall. Rigid insulation, with a minimum thermal resistance equivalent to that in the exterior walls of the building, should be provided (see Details 2.27a, b, c). If the skylight walls are inclined, insulation with a thermal resistance equivalent to the roof should be considered. This reduces the amount of snow melt that could cause ice damming.
- A roof curb is provided to raise the base of the skylight above roof level. The flatter the roof, the higher the curb should be. The table on Detail 2.27a provides recommended curb heights.
- To provide further protection against water penetration, a saddle is provided (see Detail 2.27c) to divert the water from around the skylight. This detail should be used for skylights more than 750 mm wide and for roof slopes of 3:12 or less. Saddle design and flashing requirements for around the saddle are similar to those of the chimney saddle in Detail 2.13c.

Designer Checklist

❑ Select skylights employing corner details that do not rely on sealants.

❑ Two types of skylights are typically available:
- with integral curb and flashing, ready to be installed directly on roof deck
- with a curb frame to be installed on a site-built curb.

❑ Flashing details will vary. Carefully follow the manufacturer's instructions.

❑ The skylight manufacturer's flashing kit details are used, particularly corner treatments.

❑ A saddle or similar structure on the upper part of the roof above the skylight is detailed to direct water away from the head of the skylight.

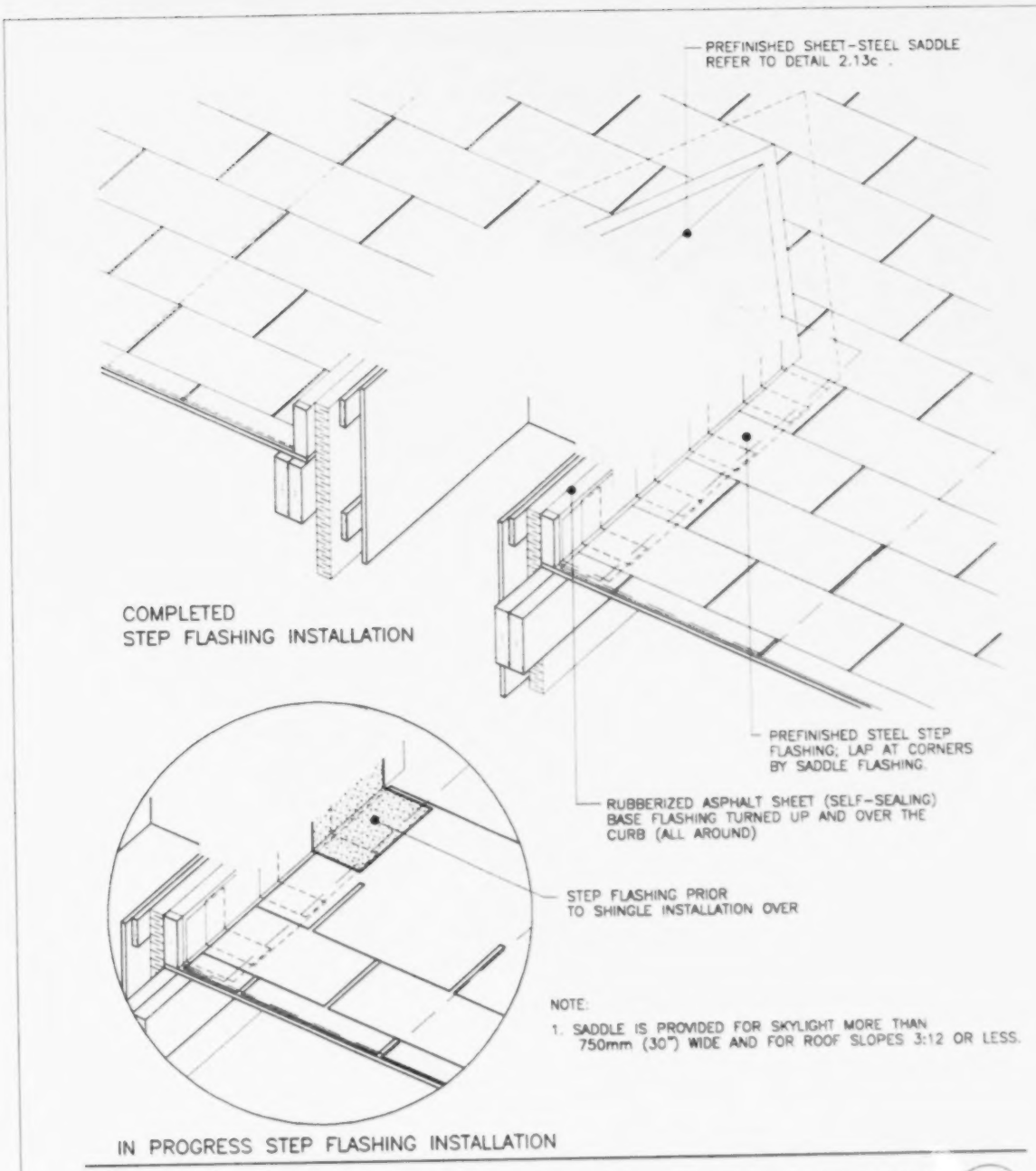
❑ If plastic or PVC skylights are used in cold climates, they must incorporate special features to allow movement due to thermal expansion and contraction differentials with the structure to which they are attached.

❑ Keep skylights away from walls or other protrusions through the roof, such as parapets, chimneys or high walls, which might encourage snow accumulation.

❑ Roof flashings are designed to allow easy removal for roof replacement.

Builder Checklist

❑ Sequence of construction:
- Install curb.
- Place self-sealing rubberized asphalt sheet underlay. Make continuous around corners.
- Turn the underlay up the curb and over the top of the curb.
- Place prefinished steel head flashing.
- If saddle is used, install saddle.
- Install shingles.
- Install step flashing interwoven with shingles.
- Install counter flashing.
- Install skylight.


PREFINISHED SHEET-STEEL SADDLE
REFER TO DETAIL 2.13c .
COMPLETED
STEP FLASHING INSTALLATION
PREFINISHED STEEL STEP
FLASHING; LAP AT CORNERS
BY SADDLE FLASHING.
RUBBERIZED ASPHALT SHEET (SELF-SEALING)
BASE FLASHING TURNED UP AND OVER THE
CURB (ALL AROUND)
STEP FLASHING PRIOR
TO SHINGLE INSTALLATION OVER
NOTE:
1. SADDLE IS PROVIDED FOR SKYLIGHT MORE THAN
750mm (30") WIDE AND FOR ROOF SLOPES 3:12 OR LESS.
IN PROGRESS STEP FLASHING INSTALLATION
SKYLIGHT – ISOMETRIC SHOWING SADDLE AND STEP FLASHING
2.27f
Filename: DET2-27f.dwg Plot Scale: 1:5 (metric)
Scale: n.t.s.

***Detail 2.27f:** Skylight–Isometric Showing Saddle and Step Flashing*

- Install interior insulation and finish.
- Ensure that ventilated space is provided under the roof around the skylight.
- Use the flashing kit designed by the skylight manufacturers.
- Ensure that flashing is continuous around the entire perimeter of the skylight.

DETAIL 2.28–OPEN VALLEY–ASPHALT SHINGLE ROOF

Purpose

To provide a waterproof transition at the intersection of two sloped surfaces of a shingle roof where the flashing is left exposed.

How It Works

- The flashing provides primary waterproofing in the valley.
- The flashing extends up the slope, underneath the shingles, to provide waterproofing in case of ice damming or snow buildup.
- Along the valley, the top corners of the shingles are clipped and the edge is sealed to the flashing with plastic cement to minimize water flow underneath the shingles and direct it toward the centre of the valley.
- If roll roofing is used, the mineral surface of the top layer sheds water from the surface and also protects against UV radiation.

Designer Checklist

❑ Specify sheet metal or a minimum of two layers of roll roofing or modified bitumen membrane for open valley flashing.

❑ Colour of roll roofing or colour and thickness of sheet metal flashing are specified.

❑ Consider a self-sealing composite membrane underneath the valley flashing as additional protection.

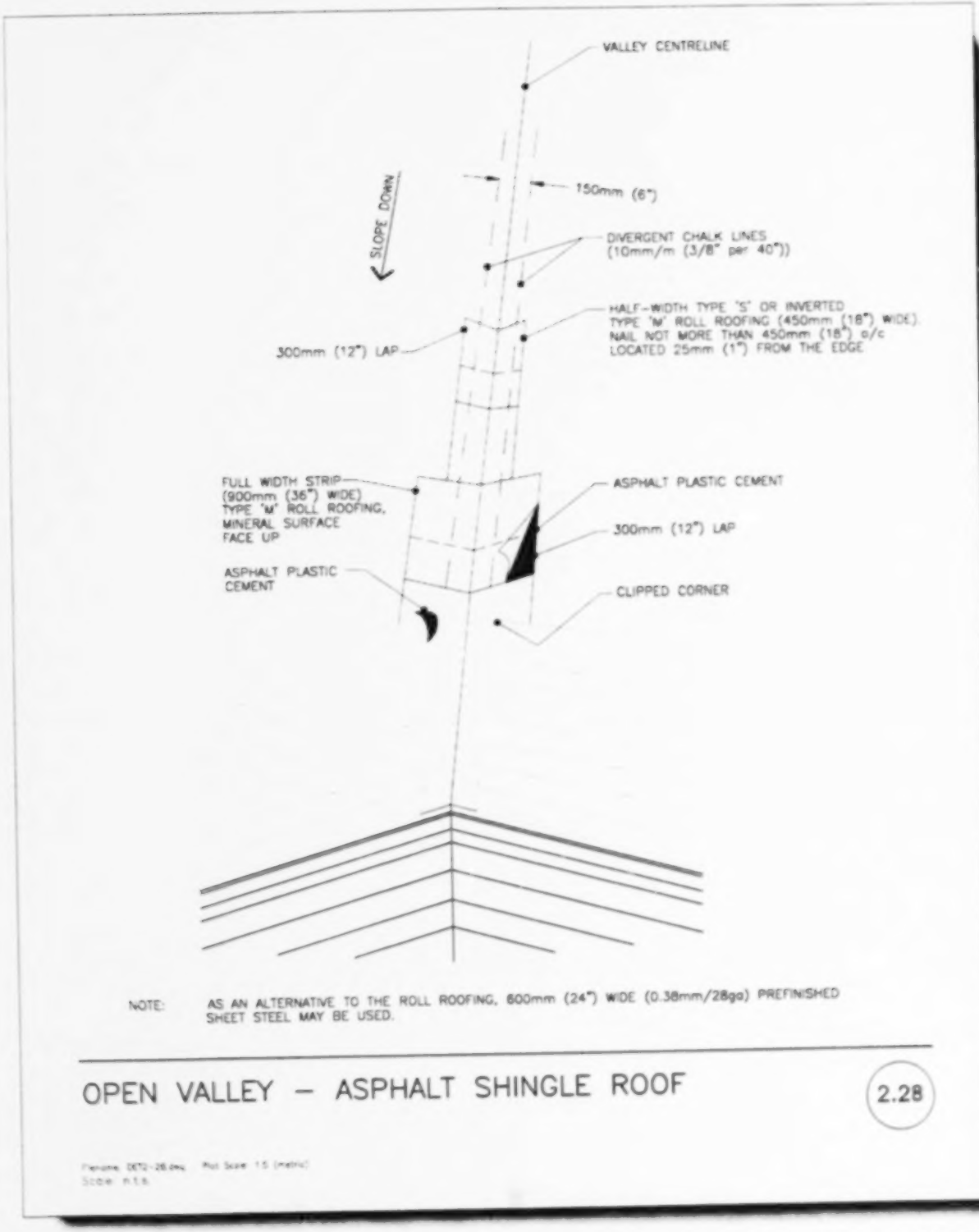
Builder Checklist

❑ Valley flashing is completed before the shingles are installed.

❑ Do not use fasteners on the shingles closer than 200 mm (3 in.) of the centre line of the valley.

❑ A 50 mm (2 in.) triangular piece is cut off at the top corners of shingles along the valley.

❑ Embed the valley edge of the shingles in a 75 mm (3 in.) wide bed of asphalt plastic cement.


VALLEY CENTRELINE
SLOPE DOWN
150mm (6")
DIVERGENT CHALK LINES
(10mm/m (3/8" per 40"))
HALF-WIDTH TYPE 'S' OR INVERTED
TYPE 'M' ROLL ROOFING (450mm (18") WIDE).
NAIL NOT MORE THAN 450mm (18") o/c
LOCATED 25mm (1") FROM THE EDGE
300mm (12") LAP
FULL WIDTH STRIP
(900mm (36") WIDE)
TYPE 'M' ROLL ROOFING,
MINERAL SURFACE
FACE UP
ASPHALT PLASTIC CEMENT
300mm (12") LAP
ASPHALT PLASTIC
CEMENT
CLIPPED CORNER
NOTE: AS AN ALTERNATIVE TO THE ROLL ROOFING, 600mm (24") WIDE (0.38mm/28ga) PREFINISHED SHEET STEEL MAY BE USED.
OPEN VALLEY – ASPHALT SHINGLE ROOF
2.28

***Detail 2.28:** Open Valley–Asphalt Shingle Roof*

DETAIL 2.29–CLOSED AND WOVEN VALLEY FLASHING

PURPOSE

To provide a waterproof transition at the valley intersection of two sloped surfaces of a shingle roof where the flashing is covered.

How It Works

- Two methods are used to close the valley with shingles, but the installation of the valley is similar.
- Shingles provide primary waterproofing by shedding water down the slope.
- The valley flashing extends up the slope underneath the shingles to provide waterproofing in case of ice damming or snow buildup.
- Asphalt shingles can crack when bent through the valley. The flashing is provided to prevent water penetrating through these cracks.

Designer Checklist

❑ Do not use closed valleys when using rigid shingles on slopes of less than 1:12.

❑ Materials used for closed valley flashings are sheet metal; a self-sealing composite membrane; or one layer of Type S or Type M roll roofing, with the mineral surface face down.

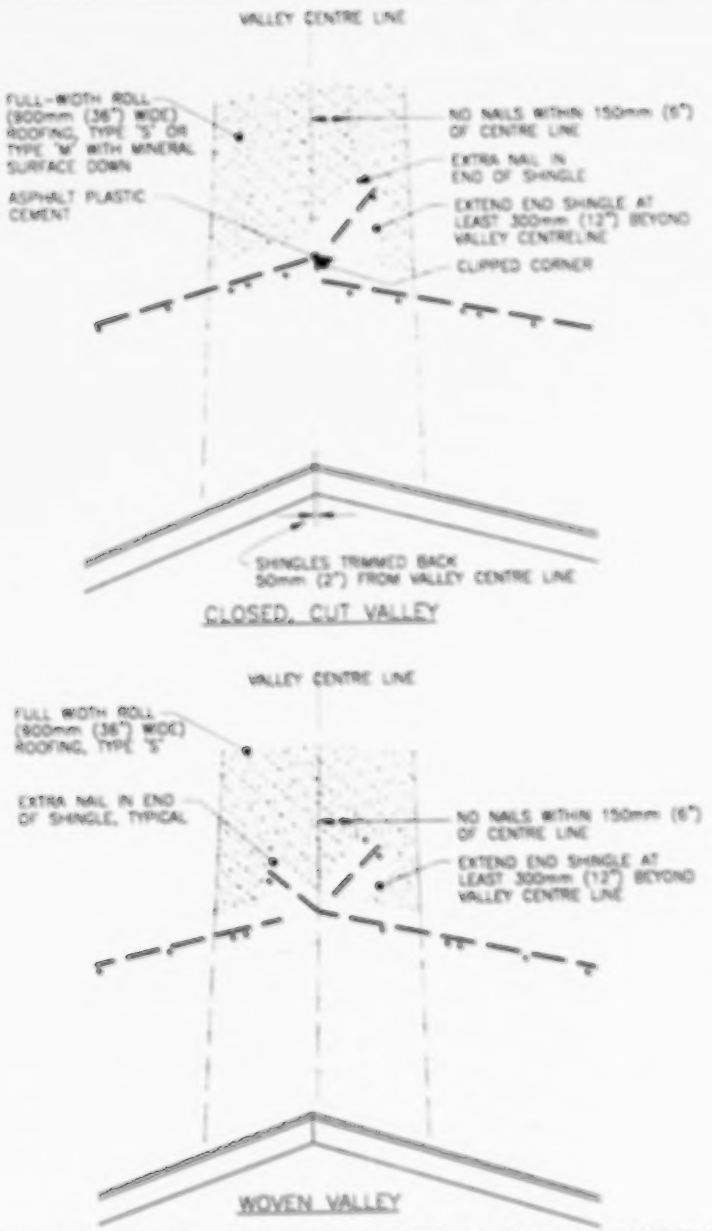
Builder Checklist

❑ Ensure valley flashing is completed before shingles are installed.

❑ Do not use fasteners to fasten shingles through flashing within 150 mm (6 in.) of the centre line of the valley.

❑ Avoid cold weather work that will result in the undesirable cracking of shingles.

❑ For closed cut valleys, a 50 mm (2 in.) triangular piece is cut off at the top corner of the upper layer of shingles along the valley. Embed the valley edge of the shingles in a 75 mm (3 in.) wide bed of asphalt plastic cement.


VALLEY CENTRE LINE
FULL-WIDTH ROLL (900mm (36") WIDE) ROOFING, TYPE 'S' OR TYPE 'M' WITH MINERAL SURFACE DOWN
ASPHALT PLASTIC CEMENT
NO NAILS WITHIN 150mm (6") OF CENTRE LINE
EXTRA NAIL IN END OF SHINGLE
EXTEND END SHINGLE AT LEAST 300mm (12") BEYOND VALLEY CENTRELINE
CLIPPED CORNER
SHINGLES TRIMMED BACK 50mm (2") FROM VALLEY CENTRE LINE
CLOSED, CUT VALLEY
VALLEY CENTRE LINE
FULL WIDTH ROLL (900mm (36") WIDE) ROOFING, TYPE 'S'
EXTRA NAIL IN END OF SHINGLE, TYPICAL
NO NAILS WITHIN 150mm (6") OF CENTRE LINE
EXTEND END SHINGLE AT LEAST 300mm (12") BEYOND VALLEY CENTRE LINE
WOVEN VALLEY
NOTE: AS AN ALTERNATIVE TO THE ROLL ROOFING, A RUBBERIZED ASPHALT SHEET ADHERED TO A PRIMED SUBSTRATE, OR PREFINISHED SHEET STEEL MAY BE USED.
CLOSED AND WOVEN VALLEY FLASHING
2.29

***Detail 2.29:** Closed and Woven Valley Flashing*

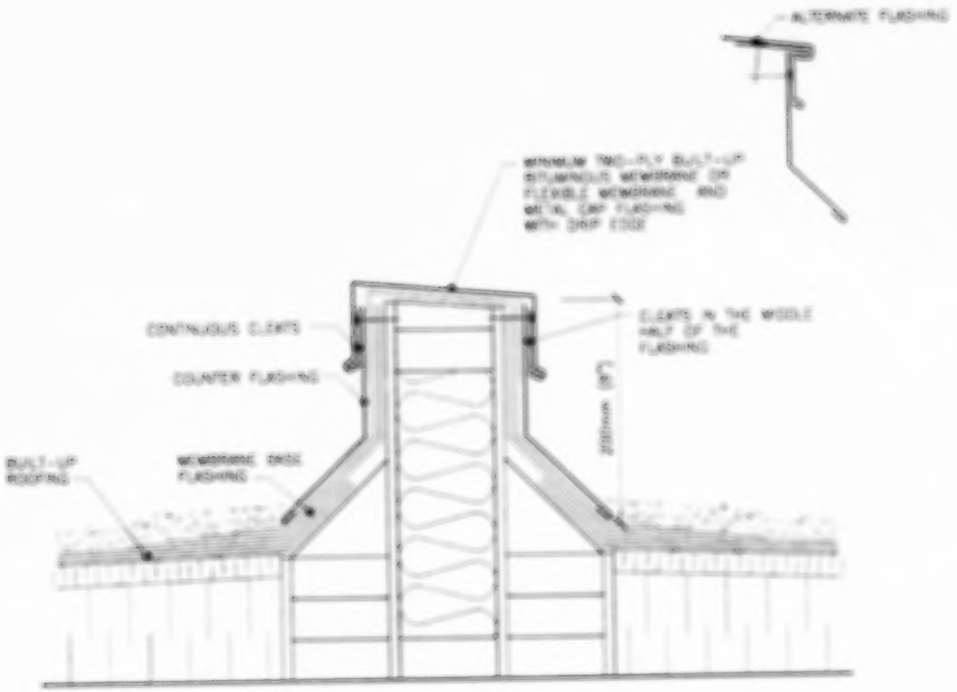
DETAIL 2.30–ROOF AREA DIVIDER

PURPOSE

To maintain a waterproof roof assembly and prevent water leakage at a transition in the roof or to limit the size of a continuous roofing membrane.

How It Works

- Roof dividers are typically installed at:
  - changes in direction of the roof deck
  - changes in composition of the roof deck assembly and membrane
  - joining of a new roofing system into an existing membrane
  - locations that limit the size of a continuous roofing membrane and therefore help minimize the effect of shrinkage and other differential dimensional changes
- Joints always constitute weak points in an assembly. Therefore it is good practice to locate them on top of a curb to limit the potential of water leakage.
- The curb is built directly on the roof deck and is anchored to it. The roofing membrane is turned up the cant, where it is lapped by a separate base flashing membrane that extends over the top of the curb. There it is lapped by the base flashing membrane from the other side of the curb.
- The base flashing membranes constitute the primary waterproofing along and over the curb. They may be built up of several plies of the same material as that of the roofing membrane, or may consist of a different but compatible material. If a built-up system is used, a minimum of one ply per side continues over the top of the wall to the other side of the curb where it is fastened. It is interwoven with the ply from the other side of the curb. The top of the curb is covered with a minimum of two plies.
- The flashing must be adequately supported by the framing of the divider wall because the top of the curb can be subject to foot traffic.
- The cant is used to ease the membrane into the change in direction. It is required for built-up roofing membranes and recommended for other types of roofing membranes.
- The membrane base flashing is covered by metal counter flashing along the sides of the curb and a metal cap flashing over the wall to protect it from impact damage and UV radiation.
- The metal counter flashing is fastened on both sides of the curb, close to the top.
- The cap flashing is sloped to one side to prevent water from ponding on top of it.



NOTES:

1. ROOFING AND BASE FLASHING – BUILT-UP BITUMINOUS ROOFING.
2. METAL CAP FLASHING AND COUNTER FLASHING (1.45mm/20gg) PREFINISHED SHEET STEEL.
3. CONTINUOUS CLEATS (2.6mm/14gg) MECHANICALLY FASTENED WITH STANDARD LARGE-HEADED ROOFING NAILS AT 300mm (12") C/C.

ROOF AREA DIVIDER

2.30

Detail 2.30: Roof Area Divider

Designer Checklist

- ❑ Locations of divider walls and roof slopes are specified.
- ❑ The divider walls do not prevent the flow of water to drains.
- ❑ Cap flashings are specified to be jointed to account for thermal movements of the metal.
- ❑ S-joints in the metal flashing are specified, with no exposed fasteners.
- ❑ Roof flashings are designed to allow for easy removal during roof replacement.

Builder Checklist

- ❑ The roof areas are properly sloped so that divider walls are located at high points and do not restrict the flow of water to the drains.
- ❑ The flashings over the curb are protected from damage during construction.
- ❑ There are no exposed fasteners.

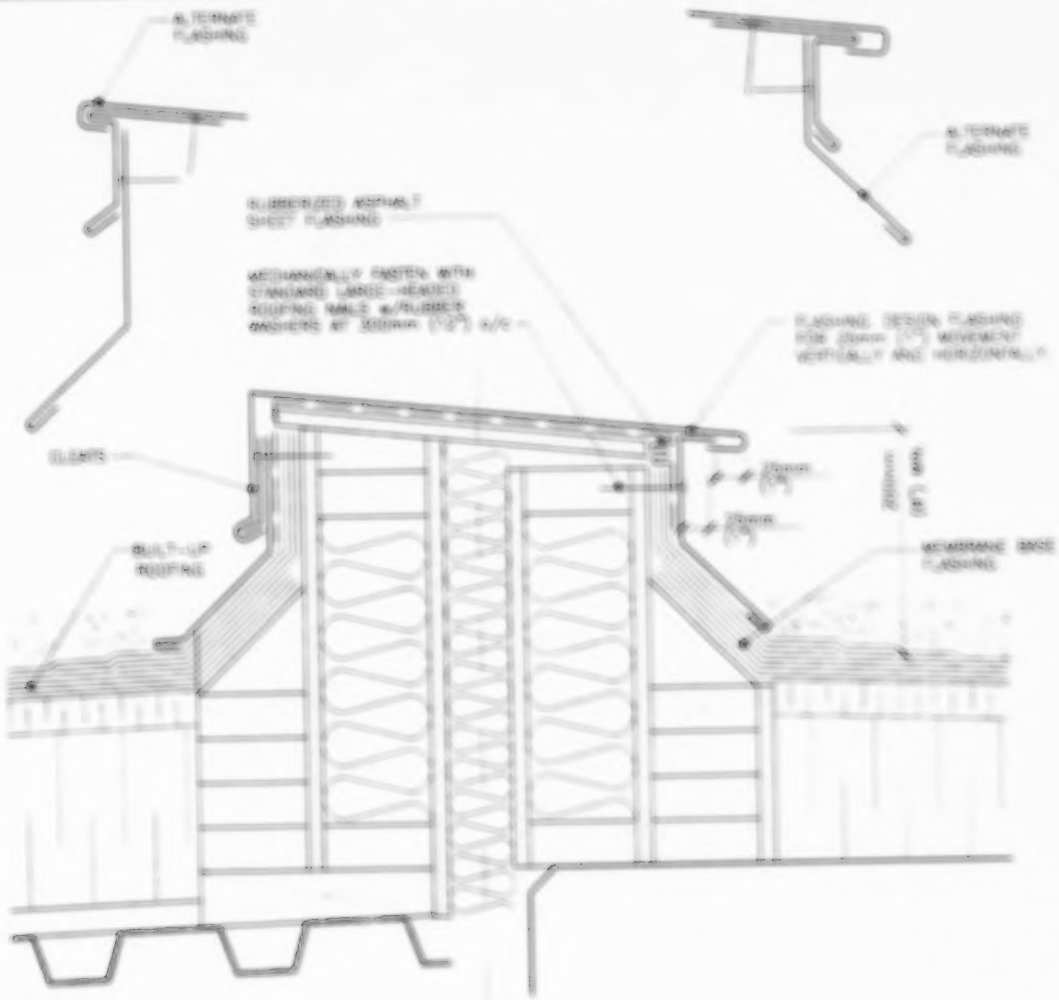
DETAIL 2.31–BUILDING MOVEMENT JOINT AT ROOF

PURPOSE

To maintain a waterproof roof assembly and prevent water leakage at a transition in the roof.

How It Works

- The building movement joint in the roofing system reflects a movement joint in the building structure, allowing the building structure to move without damage to the roof.
- Joints always constitute weak links in an assembly. Therefore it is good practice to locate them on top of a curb.
- The curb is built directly on the roof deck and is anchored to it. Along an expansion joint, the curb consists of two separate frames, one on each side of the expansion joint, with a gap for movement in between.
- On each side of the curb, the roofing membrane is turned up the cant, where it is lapped by a separate base flashing membrane, which extends to the top of the curb.
- This base flashing constitutes the primary waterproofing along the curb. It may be built up of the same number of plies of the same material as that of the roofing membrane or it may consist of a different but compatible material.
- The flashing must be adequately supported by the framing of the curb because the top of the curb can be subject to foot traffic.
- The cant is used to ease the membrane into the change in direction. It is required for built-up roofing membranes and recommended for other types of roofing membranes.
- A different but compatible flexible membrane is lapped over the base flashing and is fastened just below the top of the curb. This membrane incorporates a loop between the two rows of fasteners to allow for movement.


ALTERNATE FLASHING
ALTERNATE FLASHING
RUBBERIZED BITUMEN SHEET FLASHING
MECHANICALLY FASTEN WITH STANDARD LARGE HEADED ROOFING NAILS w/RUBBER WASHERS AT 300mm (12") c/c
FLASHING DESIGN FLASHING FOR 25mm (1") MOVEMENT VERTICALLY AND HORIZONTALLY
CLEATS
BUILT-UP ROOFING
MEMBRANE BASE FLASHING
NOTES:
1. ROOFING AND BASE FLASHING – BUILT-UP BITUMINOUS ROOFING
2. METAL CAP FLASHING w/ DRIP EDGE & COUNTER FLASHING (0.45mm/26ga) PRETREATED SHEET STEEL
3. RUBBERIZED BITUMEN SHEET ADHERED AT THE VERTICAL EDGES ONLY TO A RIGID SUBSTRATE. ADDITIONAL MATERIAL IS REQUIRED TO ACCOMMODATE MOVEMENT.
BUILDING MOVEMENT JOINT AT ROOF
2.31

Detail 2.31: Building Movement Joint at Roof

- The membrane base flashing is covered by metal counter flashing along the sides of the curb and metal cap flashing over the curb to protect it from impact damage and UV radiation.
- The metal counter flashing is fastened on both sides of the curb, close to the top. The cap flashing is sloped to one side to prevent water ponding.
- One side of the junction between counter flashing and cap flashing (the right hand side on the detail) is designed to allow movement, both horizontal and vertical. Other configurations are possible.

Designer Checklist

❑ Roof slopes are specified to ensure expansion joint curbs do not intercept the flow of water.

❑ A flexible membrane is specified over an expansion joint curb. The flexible membrane is specified to be elastomeric and able to withstand movement.

❑ Cap flashings are shown to be jointed to allow for thermal movements of the metal.

❑ S-joints in the metal flashing are specified, with no exposed fasteners.

❑ Roof flashings are designed to allow for easy removal during roof replacement.

Builder Checklist

❑ The roof areas are properly sloped to ensure that the curbs are not located at low points and do not restrict the flow of water.

❑ The flashings over the curb are protected from damage during construction.

❑ There are no exposed fasteners.

❑ Ensure that movement is possible between metal counter flashing and cap flashing.

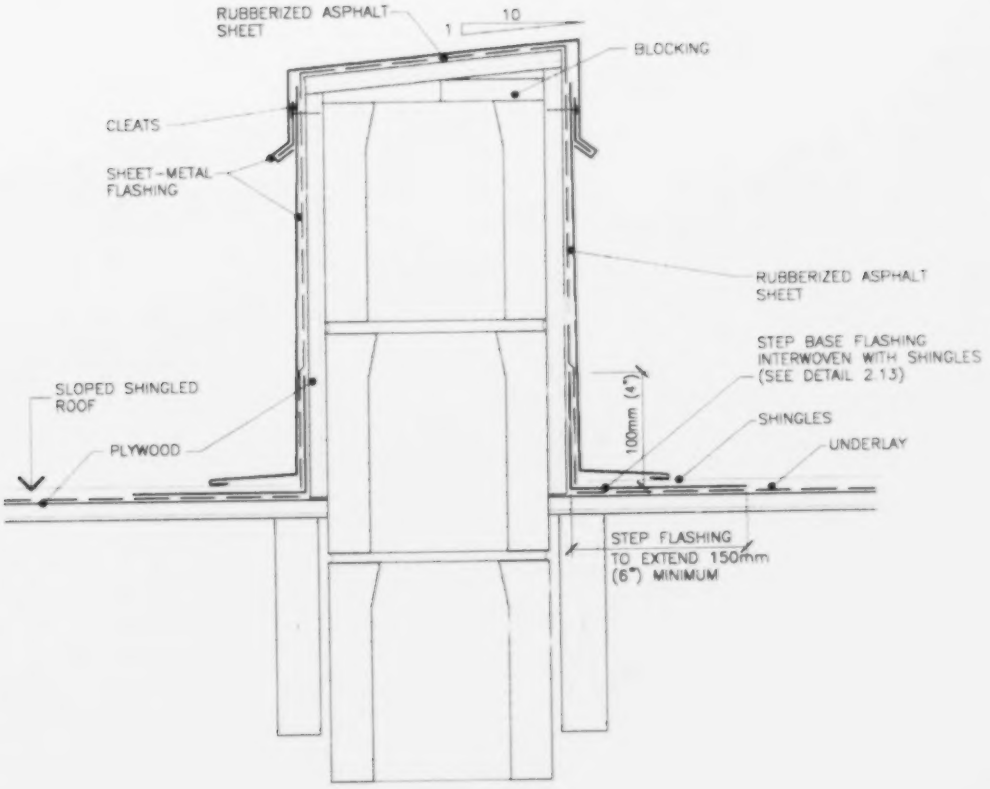
DETAIL 2.32–FIREWALL FOR SLOPED SHINGLE ROOF

PURPOSE

To provide a waterproof transition between the shingled roof and the firewall, as well as over the wall itself to control water penetration.

How It Works

- The stepped base flashing at the sides of the projecting wall is interwoven with each course of roof shingles to shed water. The base flashing must extend up the wall a minimum of 100 mm (4 in.) but is not fastened to it.
- The rubberized asphalt sheet is the flexible waterproof component of the wall. It is typically a self-sealing composite membrane. It is continuous over the wall and is lapped over the shingled base flashing to direct water onto it. Joints in the membrane should be properly lapped and made watertight.
- The flexible membrane is covered by metal counter flashing along the sides of the wall and metal cap flashing over the wall to protect it from impact damage and UV radiation. The metal flashing is not waterproof because it is jointed.
- The cap flashing is fastened on both sides of the wall using cleats.

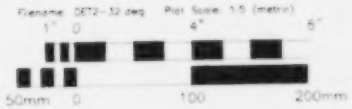


NOTES

1. PREFINISHED SHEET-STEEL (0.45mm/26ga) CAP FLASHING w/DRIP EDGE.
2. ON ONE SIDE, CONTINUOUS CLEATS (0.6mm/24ga) ARE MECHANICALLY FASTENED WITH STANDARD LARGE-HEADED ROOFING NAILS AT 300mm (12") o/c. ON THE OTHER SIDE, ONLY THE MIDDLE HALF OF A FLASHING IS SECURED WITH A CLEAT. THE ENDS OF THE FLASHING SECTION ARE FASTENED THROUGH THE 'S'-JOINT INTO THE WOOD BLOCKING OR SHEATHING.
3. RUBBERIZED ASPHALT SHEET, ADHERED TO PRIMED SUBSTRATE.

FIREWALL FOR SLOPED SHINGLE ROOF

2.32



Detail 2.32: Firewall for Sloped Shingle Roof

- Separate shingled base flashing and counter flashing allow differential movement between the wall and the roof structure.
- In cold weather, snow melting, due to heat loss from the firewall, drains down to the eaves and refreezes, causing ice damming. Water builds up behind the ice dam, ultimately penetrating below the shingles. A rubberized asphalt sheet under the asphalt shingles prevents water leakage caused by this condition (see Detail 2.28).

Designer Checklist

❑ Type and thickness of flashing materials are specified.
❑ Metal flashing is shown to be jointed to account for thermal movement of the metal.
❑ S-joints in the metal flashing are specified, with no exposed fasteners.
❑ Roof flashings are designed to allow for easy removal during roof replacement.

Builder Checklist

❑ The firewall must be completed before the roofing is installed.
❑ The stepped base flashing and shingles are installed at the same time and interwoven together.
❑ The flexible rubberized asphalt membrane and metal flashings are installed after the roof is completed.
❑ Shingled base flashing and metal counter flashing are not fastened together, allowing for differential movements.

DETAIL 2.33–PARAPET FLASHING–CONNECTION DETAILS

PURPOSE

To connect sections of metal flashing, without relying on sealants, so as to limit water penetration while allowing thermal movement.

How It Works

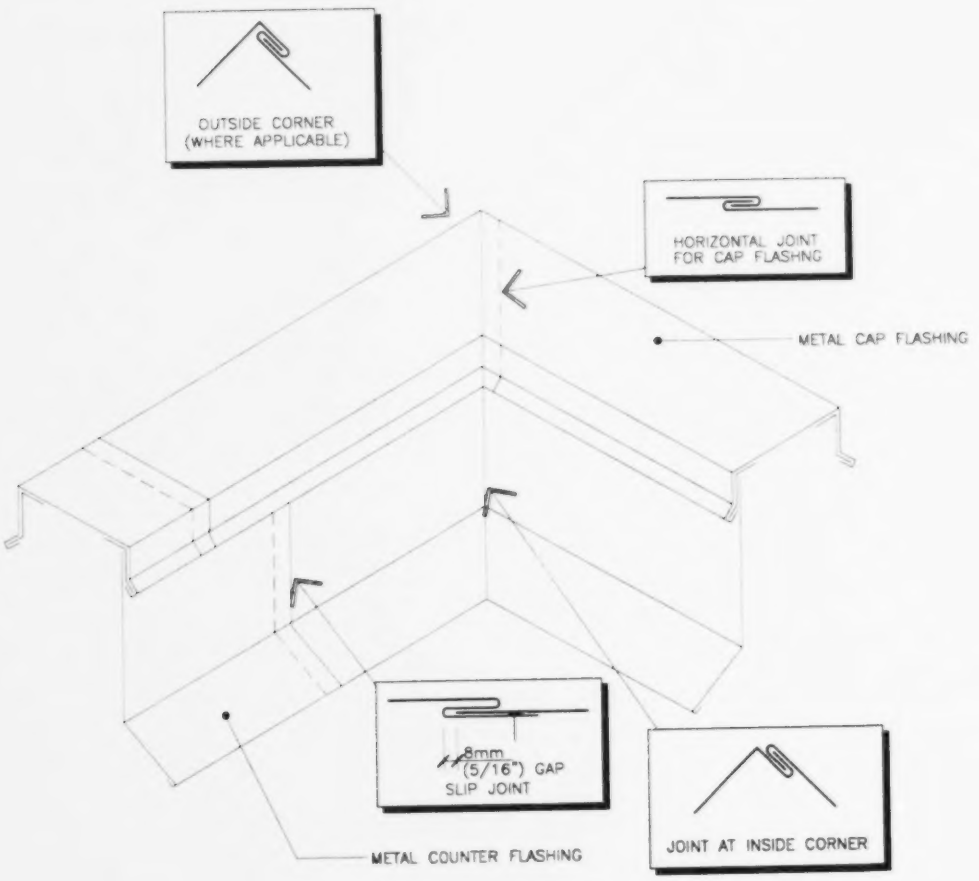
- The detail shows metal counter flashing and cap flashing on a parapet.
- In a typical slip joint (left-hand side of detail), only one of the metal sections is fastened to the back-up structure. The other section is allowed to move parallel to the wall, sliding inside the slot of the slip joint.
- The edges of the metal are folded over and interlocked to shed water on a sloped or vertical surface. However, the joint is not waterproof.
- At the corners, the metal sections are interlocked to shed water while allowing some thermal movement.

Designer Checklist

❑ Specify the installation of an impervious membrane flashing below the metal counter and cap flashings.

Builder Checklist

❑ There are no exposed fasteners.



PARAPET FLASHING – CONNECTION DETAILS 2.33

Filename: DET2-33.dwg Plot Scale: 1:5 (metric)
Scale: n.t.s

Detail 2.33: *Parapet Flashing–Connection Details*

DETAIL 2.34–ROOF PENETRATIONS–VENT PIPE –BUILT-UP ROOF

PURPOSE

To maintain a waterproof roof assembly and prevent water leakage around the penetration.

How It Works

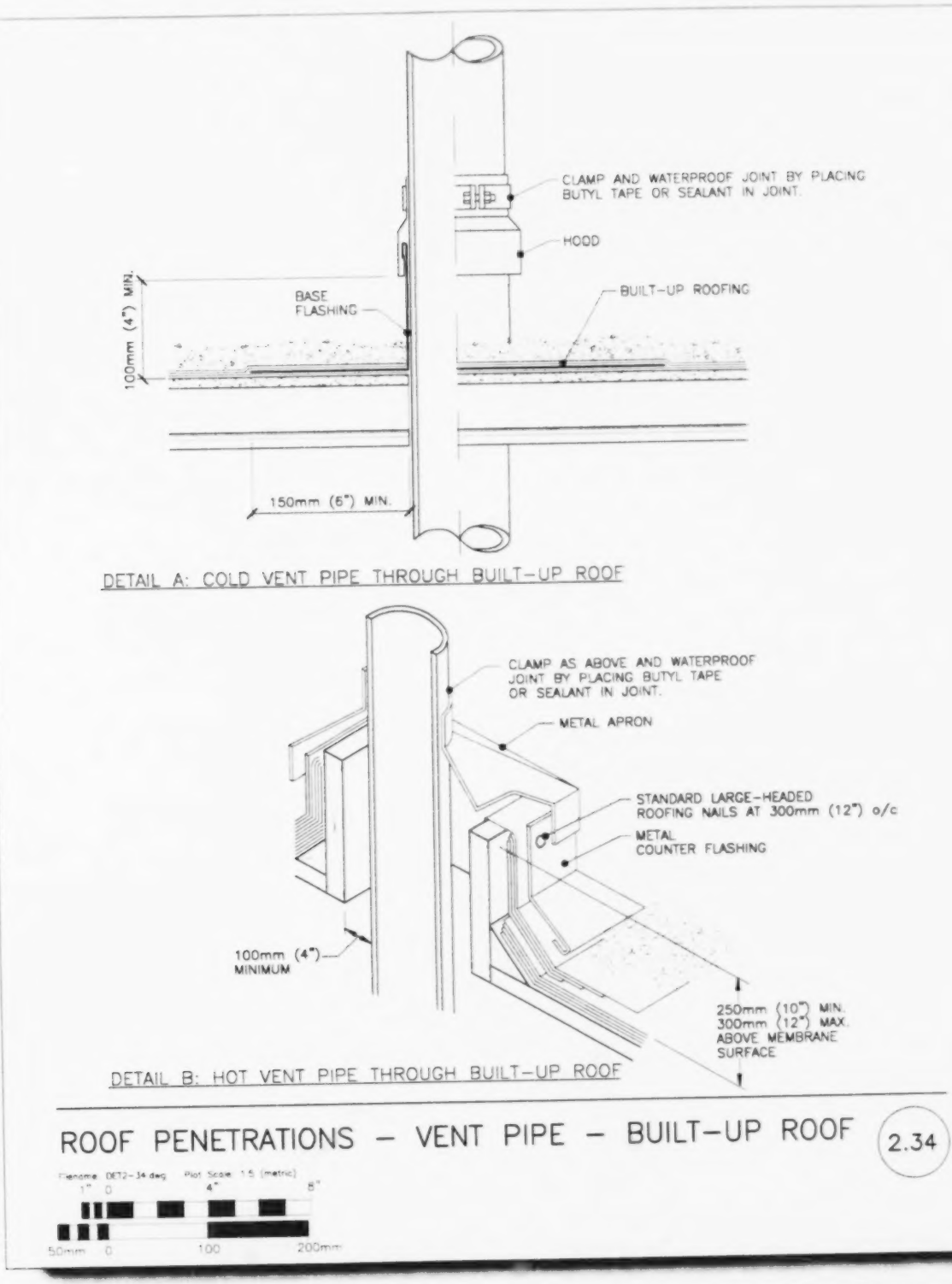
- Pipe penetrations through a roof assembly may be treated in several ways, two of which are shown in this detail.

Cold Vents

- This detail is used for tall, cold pipes, when only minimal clearance between the pipe and the roof assembly is required.
- The roof membrane is terminated as close as possible to the opening.
- The base flashing is a manufactured flanged metal or plastic sleeve. The flange is placed on the roof surface and set in bituminous material. A minimum of two plies of built-up bituminous membrane lap over the flange and onto the roofing membrane.
- The counter flashing consists of a prefabricated hood that laps over the top perimeter of the metal sleeve and is clamped or welded to the pipe perimeter.

Hot Vents

- This detail is typically used for hot pipes, such as gas vents. The clearance between the pipe and the curb openings may vary according to the temperature of the material inside the pipe. The flashing installation around the curb is similar to that of a low parapet.
- The roofing membrane is turned up the cant, where it is lapped by a separate base flashing membrane. The latter extends up to the top of the curb and is fastened to the wood blocking.
- The base flashing constitutes the primary waterproofing around the curb. It may be built up of several plies of the same material as that of the roofing membrane, or it may consist of a different but compatible material.
- The cant is used to ease the membrane into the change in direction. It is required for built-up roofing membranes and sometimes recommended for other types of roofing membranes.
- The membrane base flashing is covered by a metal counter flashing along the perimeter of the curb to protect it from impact damage and UV radiation. It is lapped by a sloped, metal cap flashing or apron over the opening, which is typically welded to the pipe. The apron is not fastened to the curb, to allow for vertical movement of the pipe.


CLAMP AND WATERPROOF JOINT BY PLACING BUTYL TAPE OR SEALANT IN JOINT.
HOOD
BUILT–UP ROOFING
BASE FLASHING
100mm (4") MIN.
150mm (6") MIN.
DETAIL A: COLD VENT PIPE THROUGH BUILT–UP ROOF
CLAMP AS ABOVE AND WATERPROOF JOINT BY PLACING BUTYL TAPE OR SEALANT IN JOINT.
METAL APRON
STANDARD LARGE–HEADED ROOFING NAILS AT 300mm (12") o/c
METAL COUNTER FLASHING
100mm (4") MINIMUM
250mm (10") MIN. 300mm (12") MAX. ABOVE MEMBRANE SURFACE
DETAIL B: HOT VENT PIPE THROUGH BUILT–UP ROOF
ROOF PENETRATIONS – VENT PIPE – BUILT–UP ROOF
2.34
Filename: DET2–34.dwg Plot Scale: 1.5 (metric)
50mm 0 100 200mm

Detail 2.34: Roof Penetrations–Vent Pipe–Built-up Roof

Designer Checklist

- ❑ Detail 2.34b has the advantage that the opening and roofing around the curb may be completed before the pipe is installed.
- ❑ Select sealant compatible with the temperature of the vent pipe.
- ❑ For Detail 2.34b, a metal sleeve or liner on the inside of the curb opening is specified to protect combustible materials, if the pipes are hot.
- ❑ The apron is specified to consist of a continuous piece of metal. If joints are needed, they should be soldered.
- ❑ Adequate provision is made for differential movement between the pipe or stack and the roof structure.
- ❑ If the pipe is cold, insulation is specified to be packed tightly between the pipe and the inside of the curb.
- ❑ Roof flashings are designed to allow for easy removal during roof replacement.
- ❑ Where several pipes penetrate the roofing membrane, locate them close to each other and treat them as shown in Detail 2.38, using an insulated pipe enclosure.

Builder Checklist

- ❑ Mechanical, plumbing and roofing work are coordinated, particularly if Detail 2.34a is used.
- ❑ The pipe penetrations are located at high points on the roofing surface.
- ❑ There are no fasteners around the perimeter of the apron in Detail 2.34b, to allow for differential movement of the pipes and the curb.

DETAIL 2.35–ROOF PENETRATIONS–PREFABRICATED VENT/PIPE FLASHING–SHINGLE ROOF

PURPOSE

To maintain a waterproof roof assembly and prevent water leakage around the penetration

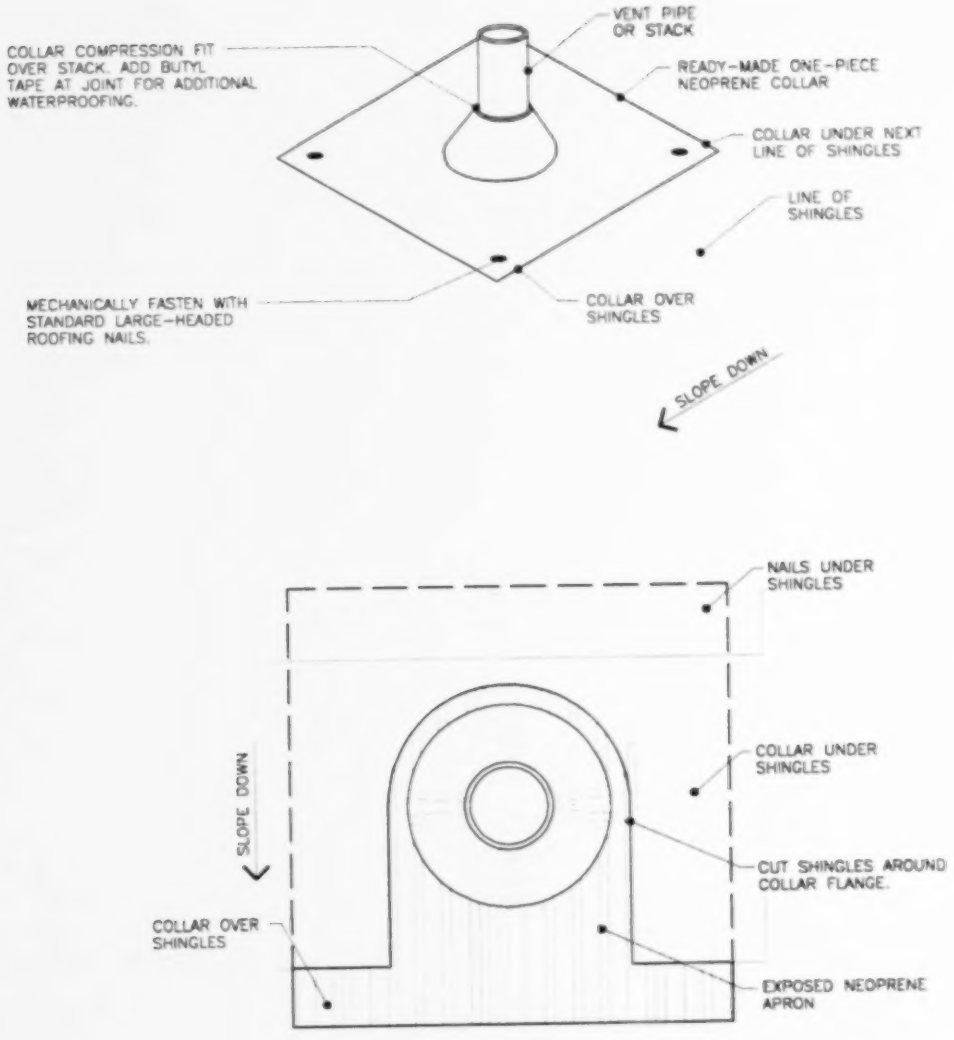
How It Works

The neoprene collar slides over the vent pipe, its lower side laps the shingles below and is in turn lapped by the next rows of shingles.

- This detail is applicable to cold pipes and shingled roofs.

Builder Checklist

- ❑ The nails in the collar are covered and protected by the shingles above.


COLLAR COMPRESSION FIT OVER STACK. ADD BUTYL TAPE AT JOINT FOR ADDITIONAL WATERPROOFING.
VENT PIPE OR STACK
READY-MADE ONE-PIECE NEOPRENE COLLAR
COLLAR UNDER NEXT LINE OF SHINGLES
LINE OF SHINGLES
MECHANICALLY FASTEN WITH STANDARD LARGE-HEADED ROOFING NAILS.
COLLAR OVER SHINGLES
SLOPE DOWN
NAILS UNDER SHINGLES
SLOPE DOWN
COLLAR UNDER SHINGLES
CUT SHINGLES AROUND COLLAR FLANGE.
COLLAR OVER SHINGLES
EXPOSED NEOPRENE APRON
PLAN VIEW
ROOF PENETRATIONS – PREFABRICATED VENT/PIPE FLASHING – SHINGLE ROOF
2.35

***Detail 2.35:** Roof Penetrations–Prefabricated Vent/Pipe Flashing–Shingle Roof*

DETAIL 2.36–ROOF PENETRATIONS–PREFABRICATED STACK FLASHING–BUILT-UP ROOF

PURPOSE

To maintain a waterproof roof assembly and prevent water leakage around the penetration.

How It Works

- This detail is similar to that in Detail 2.35 but applies to short stacks, where only minimal clearance between the pipe and the roof assembly is required.
- The roof membrane is terminated as close as possible to the opening.
- The base flashing is a prefabricated flanged metal sleeve. The flange is placed on the roof surface and set in bituminous material. A minimum of two plies of built-up bituminous membrane lap over the flange and onto the roofing membrane.
- The counter flashing consists of a prefabricated cap that covers the top perimeter of the metal sleeve and is held in place with sealant.

Designer Checklist

❑ The pipe is installed before the roofing system.

❑ Where several pipes or stacks penetrate the roofing membrane, it is recommended that they be located close together and treated as shown in Detail 2.38.

❑ Roof flashings are designed to allow for easy removal during roof replacement.

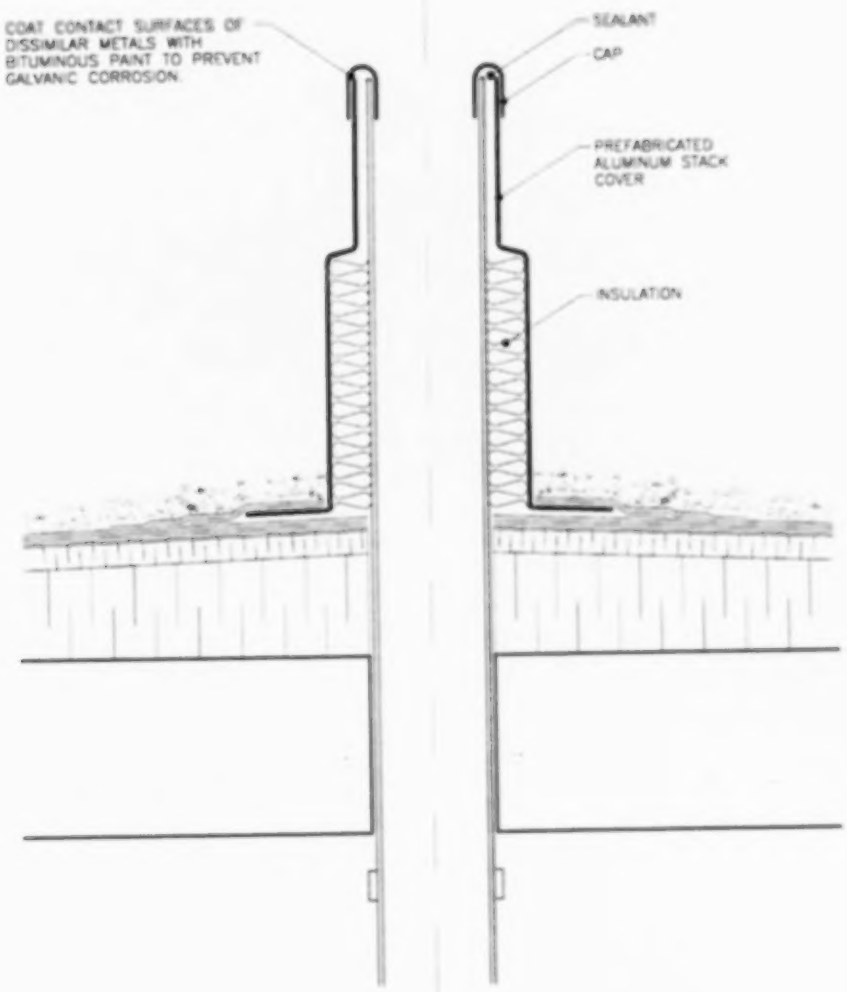
Builder Checklist

❑ Coordinate mechanical, plumbing and roofing work.

❑ The stacks are located at high points on the roofing surface.

❑ Adequate provision is made for differential movement between the pipe or stack and the roof.

❑ If the stack is delivered without insulation, fit insulation snugly between the pipe and the sleeve to limit condensation.


COAT CONTACT SURFACES OF DISSIMILAR METALS WITH BITUMINOUS PAINT TO PREVENT GALVANIC CORROSION.
SEALANT
CAP
PREFABRICATED ALUMINUM STACK COVER
INSULATION

ROOF PENETRATIONS – PREFABRICATED STACK FLASHING – BUILT-UP ROOF

2.36

Detail 2.36: *Roof Penetrations–Prefabricated Stack Flashing–Built-up Roof*

DETAIL 2.37-ROOF PENETRATIONS-INSULATED CURBED OPENING-BUILT-UP ROOF

PURPOSE

To maintain a waterproof roof assembly and prevent water leakage at the opening in the roof.

How It Works

- The roofing membrane is terminated on a curb to limit potential water leakage. The curb typically provides support for mechanical air-handling units.
- The curb is built directly on the roof deck and is anchored to it. The roofing membrane is turned up the cant, where it is lapped by a separate strip of base flashing membrane. This membrane extends over the top of the curb and is fastened on the other side.
- This base flashing constitutes the primary waterproofing along and over the curb. It may be built up of several plies of the same material as that of the roofing membrane, or it may consist of a different but compatible material. If built-up flashing is used, a minimum of two of the plies continue over the top of the curb and are fastened on the other side of the curb.
- The flashing must be adequately supported by the framing of the divider wall.
- The cant is used to ease the membrane into the change in direction. It is required for built-up roofing membranes and recommended for other types of roofing membranes.
- The membrane base flashing is covered by metal counter flashing along the sides of the curb and metal cap flashing over the wall to protect it from impact damage and UV radiation.
- The metal counter flashing is fastened on the exterior side of the curb, close to the top.
- The cap flashing is directly fastened to the interior side of the curb. This side of the curb will not be exposed.

Designer Checklist

❑ Specify the locations of curbs and roof slopes. Ensure that curbs do not impede the flow of water to drains.

❑ Metal flashings are specified to be jointed to account for thermal movements of the metal.

❑ S-joints in the metal flashing are specified, with no exposed fasteners.

❑ Roof flashings are designed to allow for easy removal during roof replacement.

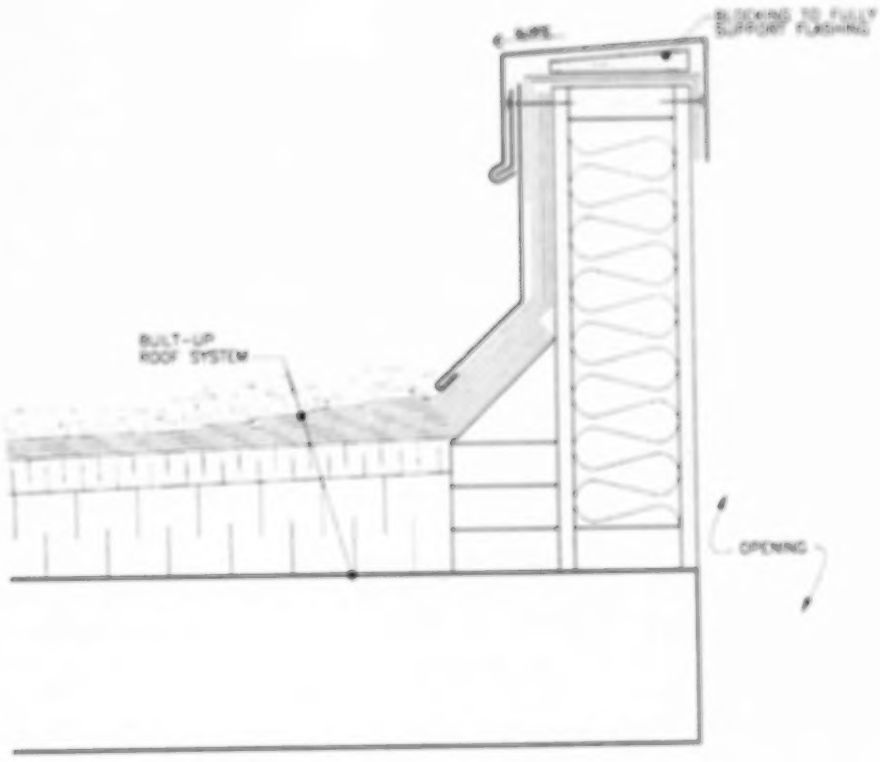
Builder Checklist

❑ The roof surface is sloped away from the curb, and the curb does not restrict the flow of water.

❑ The cap flashing is sloped outward to avoid water flowing toward the inside.

❑ Flashings over the curb are protected from damage during construction.

❑ There are no exposed fasteners.



NOTES:

1. ON INTERIOR SURFACE, MECHANICALLY FASTEN FLASHING TO SHEATHING WITH STANDARD LARGE-HEADED ROOFING NAILS AT 300mm (12") o/c.
2. PREFINISHED SHEET-STEEL (0.45mm/26ga) FLASHING WITH DRIP EDGE.
3. CONTINUOUS CLEATS (0.6mm/24ga) MECHANICALLY FASTENED WITH STANDARD LARGE-HEADED ROOFING NAILS AT 300mm (12") o/c.

ROOF PENETRATIONS – INSULATED CURBED OPENING – BUILT-UP ROOF

2.37

Detail 2.37: Roof Penetrations–Insulated Curbed Opening–Built-up Roof

DETAIL 2.38-ROOF PENETRATIONS-INSULATED PIPE ENCLOSURE-BUILT-UP ROOF

PURPOSE

To maintain a waterproof roof assembly and prevent water leakage around penetrations.

How It Works

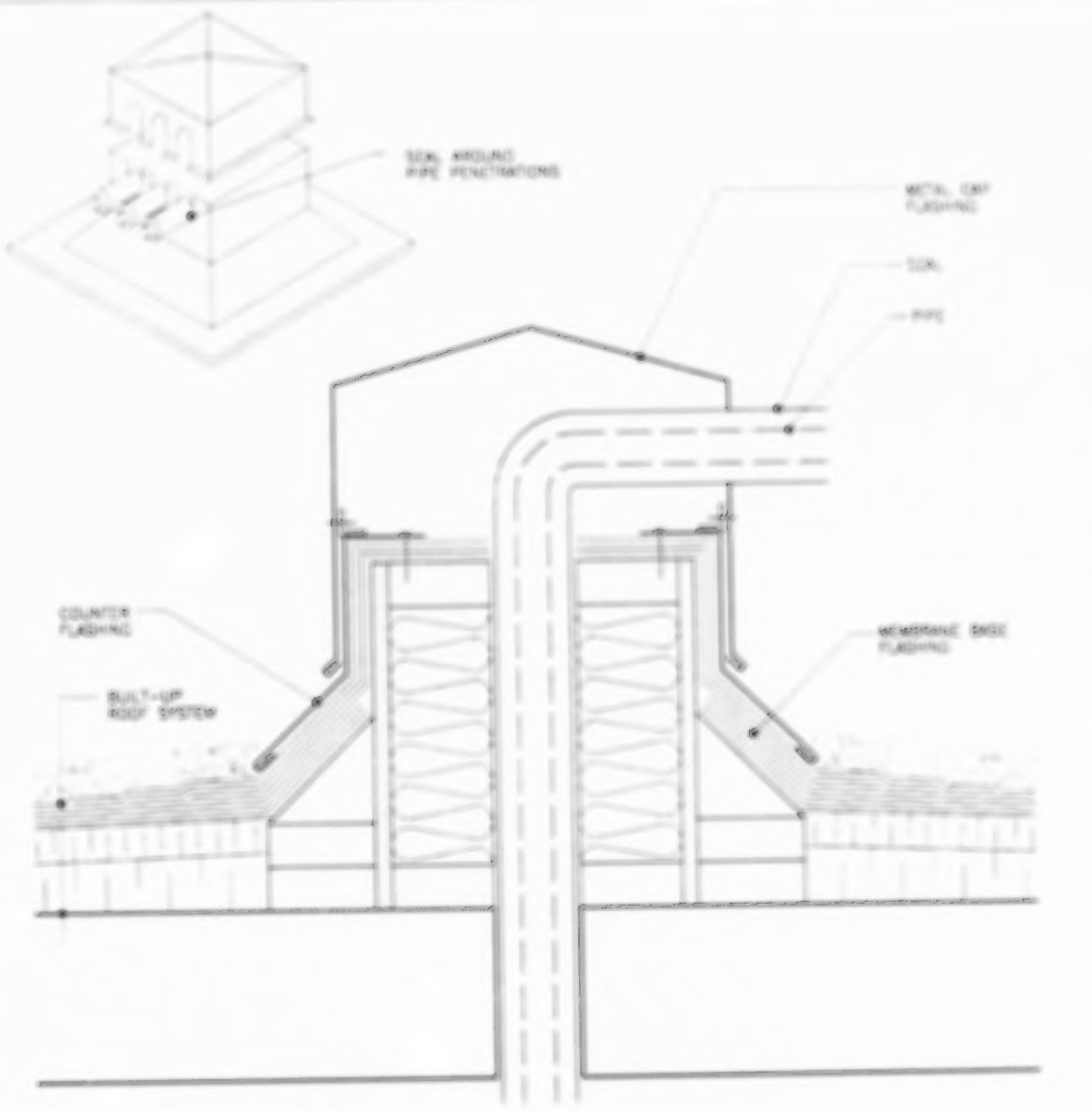
- This detail is recommended for penetrations by one or several pipes.
- It is good practice to group pipes together to reduce the number of roof penetrations.
- Place the joint between the pipe and the curb on the vertical side to limit water penetration.
- The clearance between the pipe and the curb openings may vary according to the temperature of the material inside the pipe. The flashing installation around the curb is similar to that of a low parapet.
- The roofing membrane is turned up the cant, where it is lapped by a separate base flashing membrane, which extends up to the top of the curb and is fastened to the wood blocking.
- This base flashing constitutes the primary waterproofing around the curb. It may be built up of several plies of the same material as that of the roofing membrane, or it may consist of a different but compatible material.
- The cant is used to ease the membrane into the change in direction. It is required for built-up roofing membranes and recommended for other types of roofing membranes.
- The membrane base flashing is covered by a metal counter flashing along the perimeter of the curb to protect it from damage and UV radiation. It is lapped by a metal cap flashing. Both counter and cap flashings have tight fitting cut-outs at the pipe locations. In addition, the joint between the metal flashing and the perimeter of the pipes is sealed to prevent water penetration.

Designer Checklist

- ❑ A metal sleeve or liner on the inside of the curb opening is specified to protect combustible materials, if the pipes are hot.
- ❑ Cap flashing is specified to consist of a continuous piece of metal.
- ❑ If joints are needed, they are specified to be soldered or otherwise made watertight such as by folded seams.
- ❑ Adequate provision is made for differential movement between the pipe or stack and the roof.
- ❑ Roof flashings are designed to allow for easy removal during roof replacement.

Builder Checklist

- ❑ Mechanical, plumbing and roofing work are coordinated. The opening and roofing around the curb may be completed before the pipe is installed.
- ❑ If mastic is used to close the opening between the roof slab and hot pipes, ensure that it can withstand the pipe temperature or that the pipes are insulated.


SEAL AROUND PIPE PENETRATIONS
METAL CAP FLASHING
SEAL
PIPE
COUNTER FLASHING
BUILT-UP ROOF SYSTEM
MEMBRANE BASE FLASHING
NOTES:
1. ROOFING AND BASE FLASHING -> BUILT-UP BITUMINOUS ROOFING.
2. METAL CAP FLASHING AND COUNTER FLASHING (0.45mm/26ga) PREFINISHED SHEET STEEL.
3. METAL CAP FLASHING MAY HAVE TO BE OF THICKER METAL, OR MAY NEED ADDITIONAL STRUCTURAL SUPPORT DEPENDING ON THE SIZE.
ROOF PENETRATIONS – INSULATED PIPE ENCLOSURE – BUILT-UP ROOF
2.38

Detail 2.38: Roof Penetrations–Insulated Pipe Enclosure–Built-up Roof

DETAIL 2.39–ROOF PENETRATIONS–VENT CURB–BUILT-UP ROOF

PURPOSE

To maintain a waterproof roof assembly and prevent water leakage at the opening in the roof.

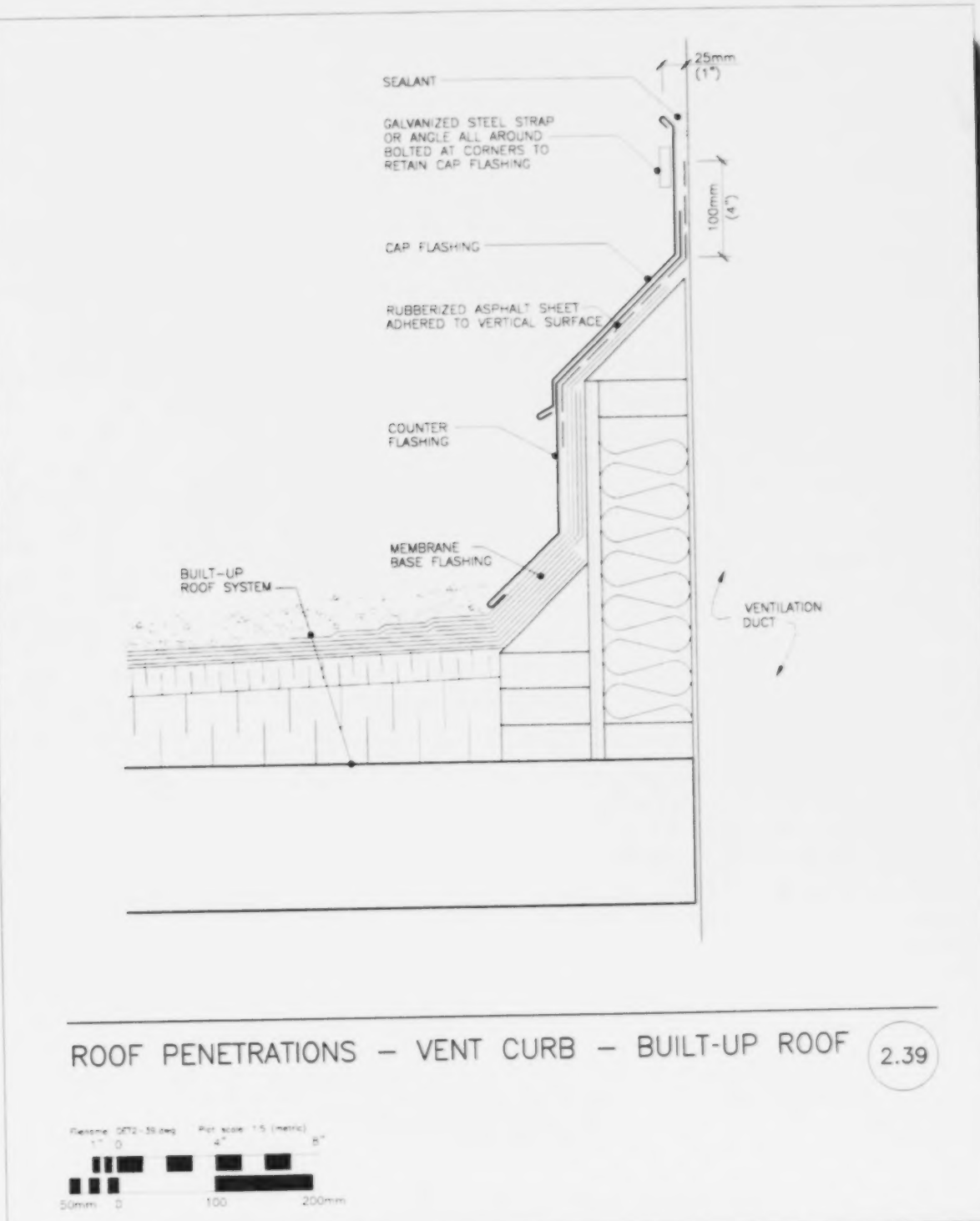
How It Works

- The roofing membrane is terminated on a curb to limit potential water leakage.
- In the detail shown, the curb does not support any mechanical units but is installed to seal around a roof penetration. The curb is built directly on the roof deck and is anchored to it.
- The roofing membrane is turned up the cant, where it is lapped by a separate strip of base flashing membrane. This membrane extends over the top of the curb and is fastened on the other side.
- This base flashing constitutes the primary waterproofing along and over the curb. It may be built up of several plies of the same material as that of the roofing membrane, or it may consist of a different but compatible material. If built-up flashing is used, a minimum of two of the plies continue to the top of the curb and are fastened on a cant strip.
- The flashing must be adequately supported by the framing of the wall.
- The cant is used to ease the membrane into the change in direction. It is required for built-up roofing membranes and recommended for other types of roofing membranes.
- The membrane base flashing is covered by metal counter flashing along the sides of the curb and lapped by metal cap flashing at the top to protect it from impact damage and UV radiation.
- The metal counter flashing is fastened on the exterior side of the curb, close to the top. The cap flashing is held by a strap or other mechanical means. The joint between the cap flashing and the duct is sealed.
- The sealed joint at the top perimeter of the cap flashing will require continuous maintenance. Where possible, the joint between the duct and the cap flashing is sheltered by making the duct larger above the curb so that it overhangs and protects the joint.

Designer Checklist

❑ Indicate locations of curbs and roof slopes. Check drainage to ensure curbs do not impede the flow of water to drains.

❑ Long metal flashings must be jointed to allow for thermal movements of the metal. S-joints in the metal flashing are specified, with no exposed fasteners.



Detail 2.39: Roof Penetrations–Vent Curb–Built-up Roof

❑ Select sealants according to the following:
- What should be the life expectancy of this joint?
- Is the sealant appropriate for the substrate, movement requirements, and exposure?
- Have joint dimensions been specified?
- Does the substrate need priming?
- Has a bond breaker or backer rod been specified?

❑ Roof flashings are designed to allow for easy removal during roof replacement.

Builder Checklist

❑ The roof surface is sloped away from the curb, and the curb does not restrict the flow of water.

❑ The cap flashing is sloped.

❑ Flashings are protected from damage during construction.

❑ There are no exposed fasteners.

❑ Sealant joints
- How will this joint work?
- Is the weather and temperature appropriate for applying the sealant application?
- Has the surface been cleaned and primed?
- Are the substrate and primer materials compatible?
- Is the joint width and depth appropriate for the expected movement?
- Is the bond breaker or backer rod of the correct size and properly positioned?
- Has the sealant been tooled to fill the joint without bubbles or other defects?
- Test to ensure that sealant adheres.

CHAPTER 3

INSPECTION AND QUALITY CONTROL

QUALITY

The following are definitions of quality for the principal parties involved in construction:

- Owner–Quality to an owner means that the construction is fit for the intended purpose and longevity and within the agreed budget.
- Designer–Quality for a designer is conformance to the requirements of the owner, the appropriate building codes and the prevailing state of the art.
- Contractor–Quality for a contractor is strict adherence of construction to plans and specifications.
- Inspector–Quality for an inspector is judging as accurately as possible the adherence of the contractor to the standards established in the plans and specifications.
- Facilities management–Quality for facilities management personnel is acceptable and predictable building performance.

RESPONSIBILITIES

The road to quality starts with the owner. The owner should provide the designer with the following expectations:

- intended purpose of the building
- expectations regarding the life span of building components
- maintenance levels acceptable to the owner
- construction cost budget consistent with the above expectations

The responsibility for providing this information rests with the owner.

The designer then defines, through drawings and specifications, the intended quality of the finished building needed to meet owner expectations. The designer should ensure that drawings and specifications are in accordance with the requirements of the following:

- building codes
- current best practice
- the agreed-to budget
- the owner's expectations

The drawings convey quantity and specifications convey to the contractor the quality of the product that the owner expects. The responsibility for the quality of this information rests with the designer.

The responsibility for constructing the building in accordance with the plans and specifications rests with the contractor. The contractor should have systems in place to accomplish the following:

- enforce work compliance with drawings and specifications
- report changes and seek approval of changes from the designer, prior to carrying out work, when compliance is impossible
- coordinate, schedule and define the roles of the tradespeople involved in the construction

QUALITY CONTROL AND QUALITY ASSURANCE

QUALITY CONTROL

The techniques and activities used to ensure that the work fulfils requirements for quality constitute quality control. For example, testing materials and inspecting installation are quality control measures.

QUALITY ASSURANCE

Planned and systematic actions are needed to ensure with adequate confidence that a product or service will satisfy given requirements for quality. These constitute Quality Assurance.

Quality assurance must begin at the design stages of the project; quality cannot be obtained after the work is complete. If the completed work is substandard, there are three options; to accept the substandard product, to repair it, or to replace it. In building construction, once a particular element is built, replacing it is usually not an option. The other two options are usually potentially detrimental to the project. It is therefore essential that a system for quality control be established right at the start of an activity and maintained through to the end to achieve the desired quality.

STEPS FOR QUALITY ASSURANCE OF FLASHINGS

1. Design drawings and specifications should clearly show the location, materials and standards of workmanship for each type of flashing.
2. Any special or extraordinary details should be discussed with an experienced contractor to ensure that the details can be built.
3. Specifications should include a requirement for a mock-up of each different flashing detail.
4. Before starting construction, a pre-construction meeting should be held to review the following:
   - flashing details
   - flashing material
   - construction sequencing and coordination of trades
   - timing of inspections
   - contractor's methods of quality control
   - construction of mock-up
   - samples of flashing materials
5. The review of any mock-ups should include testing for drainage and adhesion. At this time, a standard of minimum acceptable quality for this work should be established. The accepted mock-ups should be retained for reference.
6. The contractor's inspector should review the work every day and ensure that the standard of quality agreed to for the mock-up is maintained. The owner's inspector is expected to visit the site periodically to review the construction of selected flashings. Any deficiencies observed should be pointed out in writing to the contractor and the owner. The contractor's inspector must ensure that the deficiencies pointed out by the owner's inspector are corrected. The owner's inspector should then review the previously discovered deficiencies for evidence that they have been corrected.

FLASHINGS: SITE INSPECTION CHECKLIST

The following is a general checklist; specific designer and builder checklists are provided with each detail.

Table 3.1: Site Inspection Checklist

Type	Drainage	Adhesion	Durability	Continuity
Base flashings	• Sloped to drain	• Roofing membrane lapped as per drawings • Upturn as per drawings • Properly fasten to vertical surface as per drawings and manufacturer's instructions • Adequate bond between flashing and roofing plies • Correct priming and bonding agents used • Type and embedment of fasteners as specified • Edges terminated as designed, specified and recommended by manufacturer	• Flashing materials as specified • Corrosion-resistant fasteners as specified • Fastener embedment as specified • Dissimilar metals not in contact • Joints accommodate thermal movements • Fasteners accommodate thermal movements • Flashing fully supported where required	• Corners built as detailed in accordance with manufacturer's instructions • Terminations as detailed • Penetrations sealed
Counter flashings	• Sloped to drain • Drip edges formed	• Fastened to back-up material to prevent wind uplift as per drawings and specifications • Fastened to allow thermal movement • Type and embedment of fasteners as as specified	• Flashing material as specified for thickness, galvanizing and finishing • Corrosion-resistant fasteners as specified • Fastener embedment as specified • Dissimilar metals have separation • S-lock joints used to accommodate thermal movements • Cleats provided as specified • Corner joints mitred, folded and sealed as specified • Flashing fully supported where required • UV protection	• Penetrations sealed as detailed • Corner joints mitred, folded and sealed as specified

Table 3.1: Site Inspection Checklist (continued)

Type	Drainage	Adhesion	Durability	Continuity
Valley flashings	• Joints lapped in directions of flow as detailed	• Fastened to substrate as specified • Type and embedment of fasteners as specified	• Flashing materials as specified for thickness, galvanizing and finishing • Corrosion-resistant fasteners as specified • Fastener embedment as specified • Dissimilar metals not in contact	• End terminations properly lapped with roofing as specified • Joints lapped in direction of flow as specified • Underlay used where specified • Penetrations sealed
Wall flashings	• Sloped to drain • Drain or weepholes present • Joints lapped • End dams where detailed • Drip edge present • Sheathing paper overlaps flashing in wood construction • Air barrier overlaps flashing in cavity walls	• Lapped materials compatible • Priming and adhesives applied correctly • Types of fasteners and embedment as specified • Coping stones anchored using stainless steel dowels	• Flashing material as specified for thickness, galvanizing and finishing • Corrosion-resistant fasteners as specified • Fastener embedment as specified • Dissimilar metals not in contact • Joints accommodate thermal movement as specified	• Joints lapped • Corners adequately lapped • Penetrations sealed • Laps in flashing staggered with laps in coping stone

CHAPTER 4
SAMPLE SPECIFICATIONS

PREAMBLE

Specifications are the legal complement of plans and details. They should not duplicate the information on the drawings but guide the builder in developing the acceptable choice and application procedures for various materials. Designers must determine for themselves which documents carry information relating to material characteristics. Designers must ensure that the relevant information concerning application procedures is obtained from manufacturers and included in the specifications. The building specifications should include the following sections:

04150 Masonry Accessories
07620 Metal Flashings
07900 Sealants

The following specifications are samples, specifying materials and procedures consistent with the details in Chapter 2. These are not master specifications. Designers should explore the use of other methods and materials conforming to the relevant CSA standards.

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Flashings

MASONRY ACCESSORIES Section 04150
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PART 1–GENERAL

1.1 Related Work
.1 Masonry Procedures Section 04050
.2 Masonry Reinforcing and Connectors Section 04160

1.2 References
.1 CSA A371-94, "Masonry Construction for Buildings."

PART 2–PRODUCTS

2.1 Materials
.1 Masonry flashings:

.1 Self-adhering rubberized asphalt bonded to high-density, cross-laminated polyethylene, nominal total thickness of 1 mm (0.039 in.).

OR

.2 SBS modified bitumen reinforced with proprietary glass scrim, nominal total thickness of [ ].

.3 Galvanized steel 0.33 mm (0.013 in.) (minimum) core nominal thickness, Z275 zinc-coating designation, to ASTM A525M-80, prefinished to CGSB 93-GP-3M, Class FIS.

.4 Adhesive: recommended by manufacturer of flashing material.

.5 Primer: recommended by manufacturer of self-adhering flashing.

.6 Plastic cement for bedding metal flashings shall conform to CGSB 37-GP-5M.

.2 Mortar-dropping control device: polyethylene net 90% open weave, 250 mm (8 in.) high or [ ] or [ ].

PART 3–EXECUTION

3.1 Masonry Flashing .1 Install flashing in masonry in accordance with CSA A371-94, as shown on the drawings.

.2 Carry flashings from front edge of masonry, under outer wall layer, then up exterior face of inner wall layer.

.3 Prime all surfaces to receive self-adhering flashing.

.4 Adhere [reinforced modified bitumen] flashing in full coat of adhesive to all substrates.

.5 Where an air barrier membrane is present in the cavity, adhere the air barrier membrane to the flashing.

.6 Lap joints of flexible flashings 50 mm (2 in.) and seal. Use adhesive for reinforced modified bitumen flashing.

.7 Lap joints of polyvinyl chloride flashing (100 mm (4 in.) minimum) and seal with adhesive.

.8 Metal flashings to be furnished and cut to size by sheet-metal contractor, for installation by masonry contractor. All joints to lap 100 mm (4 in.) minimum and be soldered.

.9 For through-wall flashings, extend the flashing 10 mm (0.4 in.) minimum beyond the exterior face of the brick.

3.2 Mortar-dropping Control Device .1 Install continuous mortar-dropping control device in air space behind weepholes.

END OF SECTION 04150

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PART 1 GENERAL

1.1	Related Work	.1	Masonry Accessories Section 04150
1.2	Mock-Up	.1	Build mock-ups for each type of flashing and counter flashing complete with all fasteners as per drawings and specifications, and obtain Architect's approval prior to fabrication of any further metal flashings.
1.3	Product Delivery, Storage and Handling	.1	Deliver sheet-metal flashing materials to site and store in safe, protected storage area to prevent damage.
		.2	Stack flashings to prevent twisting or bending out of shape.
		.3	Prevent contact of flashing materials with corrosive substances.
		.4	Damaged materials shall be replaced with new materials.
		.5	Handle and store metal flashings so that marring and scratching of the coatings do not occur.
1.4	Guarantee	.1	Guarantee flashing assembly free of the following defects: splitting seams, lifting, loosening and undue expansion for two years from date of substantial performance.

PART 2–PRODUCTS

2.1	Materials	.1	**Metal Flashings** Galvanized steel, 0.45 mm (26 ga.) (0.018 in.) core nominal thickness, Z275 zinc-coating designation, to ASTM A525M-80, prefinished to CGSB 93-GP-3M, Class FIS. Colour to Architect's later choice from manufacturer's standard range.

.2 **Cleats and Fasteners**

Cleats and fasteners shall be of the same material as the metal they are designed to secure. Size shall be to suit components to be secured. Gauge shall be sufficient to retain the flashings in place.

.3 **Nails**

Hot-dipped galvanized steel, spiral thread, of sufficient length to provide a minimum 25 mm (1 in.) penetration into substrate.

.4 **Plastic Cement**

Plastic cement for caulking and bedding flashings shall conform to CGSB 37-GP-5M.

.5 **Sealant**

Refer to section 07900.

.6 **Bituminous Paint**

Bituminous paint shall conform to CGSB 1-GP-108, Type II.

PART 3–EXECUTION

3.1 Workmanship .1 Metal flashing shall be as detailed, supplemented by recommendations of Canadian Roofing Contractors' Association Specifications.

.2 All free edges of metal flashing shall be strengthened by a fold at least 13 mm (0.5 in.) wide, turned out slightly and presenting a straight line and neat finish.

.3 Form flashings in 2400 mm (8 ft.) lengths whenever possible. Make allowance for expansion at joints.

.4 End joints where adjacent lengths of metal flashing meet shall be made using an S-joint. This shall be executed by inserting the end of one coping length in a 25 mm (1 in.) deep S-joint formed in the end of the adjacent length in a full bed of caulking compound. Concealed portion of the S-joint shall extend 25 mm (1 in.) outwards and be nailed to the substrate. Face nailing of the joints will not be permitted.

.5 The metal shall be formed on a bending brake. Shaping, trimming and hand-seaming shall be done on the bench as far as is practicable with the proper sheet-metal working tools. The angle of the bends and the folds for interlocking the metal shall be made with full regard to expansion and contraction to avoid buckling or fullness in the metal after it is in service and to avoid damaging the surface of the metal.

.6 Install continuous starter strips where indicated or required to prevent a true, non-wearing, leading edge. Anchor to back-up to provide rigid, secure installation.

.7 Apply isolation coating to aluminum surfaces to be in contact with concrete or mortar.

.8 Corner joints where adjacent lengths of metal flashing meet shall be made using folded joints. Apply a continuous bead of sealant as an additional protection.

3.2 Counter Flashings

.1 Install counter flashings as soon as possible after membrane flashings are in place.

.2 Counter flashings shall have a folded, bottom-edge, stiffening break, where indicated, and shall extend up the vertical face of the wall or curb to height shown, then be turned into reglets or interlocked with cap flashings.

.3 Wedge flashings into reglets and caulk neatly using specified sealant and bond breaker.

3.3 Cap Flashings .1 Tops of walls, parapets, counter flashings and the like shall be cap flashed as detailed, after membrane and metal counter flashings are in place.

END OF SECTION 076220

PART 1–GENERAL

1.1	Guarantee	.1	Provide a written guarantee, signed and issued in the name of the owner, stating that caulking work of this section is guaranteed against leakage, cracking, crumbling, melting, shrinkage, running, loss of adhesion, staining adjacent surfaces, or other failure, for a period of three years from the date of Certificate of Substantial Performance.
1.2	Delivery, Storage and Handling	.1	Deliver and store materials in original wrappings and containers with manufacturer's seals and labels intact. Protect from freezing, moisture and water.
1.3	Environmental and Safety Requirements	.1	Comply with requirements of Workplace Hazardous Materials Information System System (WHMIS) regarding use, handling, storage and disposal of hazardous materials; and regarding labelling and provision of material safety data sheets acceptable to Human Resources Development Canada.
		.2	Conform to manufacturer's recommended temperatures, relative humidity and substrate moisture content for application and curing of sealants, including special conditions governing use.
		.3	Architect will arrange for ventilation system to be operated on maximum outdoor air and exhaust during installation of caulking and sealants.] [Ventilate work area as directed by architect, using approved portable supply and exhaust fans.]

PART 2–PRODUCTS

2.1 Sealant Materials

.1 Sealants shall conform to CGSB specifications as listed below; colour to architect's selection.

.1 Type 1: Multi-component, epoxidized polyurethane terpolymer sealant. To meet specified requirements of CGSB Specification CAN2.19-24-M90. Use at all locations including sealant beads below foundation flashing and flashing at shelf angles, except where another type is specified.

.2 Type 2: One part elastomeric sealants: to meet specified requirements of NSC/CGSB Specification CAN2-19.13-M87.

.1 Classification MC-2-25-B-N moisture curing hybrid polyurethane. Use at curtain wall joints; perimeter caulking of windows, doors and panels; bedding for mullions, panels and frames.

.2 Classification MCG-2-25-A-L medium modulus silicone, to be used in glass-to-glass, glass-to-metal and metal- to-metal joints.

2.2 Back-up Materials

.1 Polyolefin polyethylene, urethane, neoprene or vinyl foam

.1 Extruded closed cell backer rod.
.2 Size: oversize 30–50%.
.3 Chemically compatible with primers and sealants.
.4 Round solid rod. Shore A hardness 70.

.2 Bond breaker tape

.1 Polyethylene bond breaker tape that will not bond to sealant.

2.3 Joint Cleaner

.1 Non-corrosive and non-staining type, compatible with joint-forming materials and sealant recommended by sealant manufacturer.

2.4 Primer

.1 Primer: as recommended by manufacturer.

PART 3–EXECUTION

3.1 Extent of Work

.1 Install sealants in all locations shown on drawings.

.2 Install sealant at the perimeter of all exterior openings where doors, windows, grilles and other items abut or penetrate the exterior wall materials.

.3 At all door saddles, spread a bead of sealant compound over entire seat of saddles at least 3 mm (0.12 in.) thick before installing saddle.

.4 Seal the junctions of differing exterior wall materials.

.5 Provide a minimum of two continuous beads of sealant under all prefinished galvanized steel wall flashings.

3.2 Preparation of Joint Surfaces

.1 Examine joints sizes and conditions to establish correct depth- to-width relationship for installation of backup materials and sealants. Maintain depth of sealant at middle of joint width as follows:

Joint Width	Sealant Width
6 mm (0.25 in.)	6 mm (0.25 in.)
20 mm (0.75 in.)	10 mm (0.4 in.)
32 mm (1.25 in.)	13 mm maximum (0.5 in.)
Minimum adhesion surface shall be 1.5 times depth.	

.2 Clean bonding joint surfaces of harmful substances including dust, rust, oil, grease and other matter that may impair work.

.3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent or other coatings, unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

.4 Ensure joint surfaces are dry and frost-free.

.5 Prepare surfaces in accordance with manufacturer's directions.

3.3 Priming

.1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and sealing.

.2 Prime sides of joints in accordance with sealant manufacturer's instructions, immediately prior to sealing.

3.4 Backup Material

.1 Apply bond breaker tape where required to manufacturer's instructions.

.2 Install joint filler to achieve correct joint depth and shape.

3.5 Mixing

.1 Mix materials in strict accordance with sealant manufacturer's instructions.

3.6 Application

.1 Sealant:

.1 Apply sealant in accordance with manufacturer's instructions within temperature restrictions.
.2 Apply sealant in continuous beads.
.3 Apply sealant using gun with proper-sized nozzle.
.4 Use sufficient pressure to fill voids and joints solidly.
.5 Form surface of sealant with full bead, smooth, and free from ridges, wrinkles, sags, air pockets and embedded impurities.
.6 Tool exposed surfaces to give slightly concave shape.
.7 Remove excess compound promptly as work progresses and upon completion.

.2 Curing:

.1 Cure sealants in accordance with sealant manufacturer's instructions.
.2 Do not cover up sealants until proper curing has taken place.

.3 Cleanup:

.1 Clean adjacent surfaces immediately and leave work neat and clean.
.2 Remove excess and droppings, using recommended cleaners as work progresses.
.3 Remove masking tape after initial set of sealant.

END OF SECTION 07900

CHAPTER 5
CAD DETAIL LIBRARY

OVERVIEW

The *CMHC Best Practice Guide: Flashings* CAD Detail Library is a collection of drawing files created with AutoCAD release 12 software. Two types of files are included. The first type of file ends with the .DWG filename extension. The .DWG extension files are in AutoCAD drawing format and are compatible with versions of AutoCAD starting with release 10 or any other CAD/graphics package capable of importing AutoCAD release 10 drawings. The second type of file, .DXF, is provided for universal importation into other CAD/graphics programs that do not support the .DWG format but support .DXF files. Consult your software manual on how to import .DWG or .DXF files into your CAD/graphics program.

The CAD Detail Library does not require any special configurations of your CAD, graphics or computer operating system. The detail drawings require no more memory or disk space than if you had created them yourself.

The details are designed to be usable without modification. Each library detail has been prepared to allow simple insertion onto a drawing sheet. You may explode and modify the details as required and use their components as blocks in the same way you would use a block you created yourself. You may wish to save your modified versions as new, separate drawing files for future use.

ASSUMPTION

It is assumed that the user has a basic knowledge of his or her CAD/graphics software, and therefore no attempt has been made to explain layering, fonts, colours and other basic drawing conventions of these programs.

DISCLAIMER

The drawings and texts are intended as a general practice guide only. CMHC does not warrant, nor assume liability for, the accuracy or completeness of the drawings or texts, or their fitness for any particular use. It is the responsibility of users to apply their professional knowledge in the use of information contained in these drawings, specifications and tests, to consult original sources, or when appropriate, to consult an architect or engineer.

Project- and site-specific factors of climate, exposure, cost, aesthetics and so on must be taken into consideration in the design of an appropriate building envelope.

WHAT'S ON THE DISK

The details and text in the guide are also included on the CD-ROM. A README.TXT file is included that contains information on layering, pen weight/colour assignments and other drawing information.

REFERENCES

Beznaczuk, L. M., and M. A. Lacasse. *Construction Practice: Prototype Sealant Selection Systems*. Ottawa, ON: Institute for Research in Construction, National Research Council.

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Ontario Code and Construction Guide for Housing (2nd ed.). Don Mills, ON: Ontario Ministry of Housing and New Home Warranty Program, June 1993.

Patenaude, A. *Migration of Water By Capillarity*. Ottawa, ON: CMHC, 1993.

Skylight detail: *Guide technique visant la conception, l'installation et l'utilisation des lanterneaux aux fenêtres inclinées*. Unpublished 1997 research report by Association provinciale des constructeurs d'habitation du Quebec.

APPENDIX A

FILES ON CD-ROM

Drawing Files

The details included in this guide are also included in the CD-ROM as AutoCAD® release 12 DWG files, and as DXF files. All are provided in SI (Metric) versions at 1:5 scale and are plotted at 1:1 plotting scale, with layers offering a choice of English or French notes and titles. Refer to README.TXT on **CD-Rom** for further information.

This CD contains the following directories and their sub-directories:

- DWG (A directory containing drawings of details in AutoCAD
- DXF (A directory containing drawings of details in DXF format
- PDF (Complete set of the documentation in PDF format)
- SPEC (Complete specification in txt file format)

About 6 megabytes of free space is required for the DWG files and 16.5 megabytes for the DXF files.

In addition to the above directories, the CD contains the following files:

AR16E301.EXE : Installs Acrobat Reader for Windows 3.1x
AR32E301.EXE : Installs Acrobat Reader for Windows 95
LIC_RDR.PDF : A licence agreement for the Acrobat Reader
README.TXT : The README file
LISEZMOI.TXT : Same as the README file but in French

To install the Acrobat Reader on Windows 3.1x:

1. From Program Manager, Select **File** then **Run**
2. Browse and Select AR16E301.EXE
3. Click on OK

Follow the instructions on the screen.

To install the Acrobat Reader on Windows 95:

1. From **START** menu, Select **Run**
2. Browse and Select AR32E301.EXE
3. Click on OK

Follow the instructions in the screen.

Specification Files

The guide specifications, sections 04150, 07620 and 07900, are included in the CD-ROM in WP5 format conforming to the CSC Electronic Style Guide, which should be capable of being used with almost any PC-compatible word processor. It is provided in both English and French, in SI (Metric) units, CSC Page Format, and refers to applicable Canadian standards. Refer to README.TXT on **CD-Rom** for further information.

Other useful information products from Canada Mortgage and Housing Corporation.

Innovation Centre for Highrise and Multiples
Stay up-to-date with the latest research through the Innovation Centre for Highrise and Multiples Web site, reachable through the main CMHC Web site at www.cmhc-schl.gc.ca

Best Practices Guide: Brick Veneer Steel Stud
Improve building envelope performance with this easy to-follow guide. Includes a CD-ROM with CAD drawings and specification tables in metric and imperial measurements. **Order # 61120**

Best Practices Guide: Brick Veneer Concrete Masonry
Discover the benefits of various components and materials used in brick veneer/concrete masonry unit backing and important considerations in their applications. Includes a CD-ROM with details, and checklists to help with construction sequencing, inspection and quality control. **Order # 61121**

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